This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
N91 .T47 1871 STOR
Practical lithotomy and lithotrity, or,
24503324864

Lane Medical Library
Stanford University Medical Center

Gift

PRACTICAL
LITHOTOMY AND LITHOTRITY.

By the same Author.

THE DISEASES OF THE PROSTATE;
THEIR PATHOLOGY AND TREATMENT.
With Plates. Third Edition. 8vo, 10s.

STRICTURE OF THE URETHRA AND URINARY FISTULÆ;
THEIR PATHOLOGY AND TREATMENT.
With Plates. Third Edition. 8vo, cloth, 10s.

CLINICAL LECTURES ON DISEASES OF THE URINARY ORGANS,
Delivered at University College Hospital. Second Edition, crown 8vo, 5s.

PRACTICAL LITHOTOMY AND LITHOTRITY;

OR,

AN INQUIRY INTO THE BEST MODES

OF

REMOVING STONE FROM THE BLADDER.

BY

SIR HENRY THOMPSON,

SURGEON EXTRAORDINARY TO H.M. THE KING OF THE BELGIANS; PROFESSOR OF
CLINICAL SURGERY, AND SURGEON TO UNIVERSITY COLLEGE HOSPITAL.

SECOND EDITION, CONSIDERABLY ENLARGED.

LONDON:
J. & A. CHURCHILL, NEW BURLINGTON STREET.
MDCCCLXXI.

LANE LIBRARY. STANFORD UNIVERSITY

LONDON:
PRINTED BY WOODFALL AND KINDER,
MILFORD LANE, STRAND, W.C.

TO STUDENTS IN MEDICINE,

ESPECIALLY TO THOSE, BOTH PAST AND PRESENT, OF

UNIVERSITY COLLEGE HOSPITAL,

WITH WHOM, AS COMPANIONS AND FELLOW-WORKERS, I HAVE SPENT

SOME OF THE MOST PLEASANT HOURS OF MY LIFE,

This Work is Inscribed,

BY

THE AUTHOR.

THE PREFACE TO THE FIRST EDITION.

THE larger portion of the matter contained in the following pages was prepared for the Lettsomian Surgical Lectures of the Medical Society of London for the past year. The limits prescribed, however, permitted me to select for delivery only a portion of the matter prepared. I have, therefore, determined on publishing the whole in its original form, believing that in this way only could I hope to do anything like justice to the subject itself, or to the views which are put forth in relation to it.

I may premise that it is no part of my design to present a history of the means employed during the last 2000 years to remove stone from the human bladder. Neither is any portion devoted to discussions respecting the chemical and physical constitution of calculi, the causes of calculous formation, or the symptoms which the presence of stone in the bladder gives rise to; these subjects having, with the exception of causation, been fully and successfully examined.

The sole object of this work is to present a consideration of the best operative procedures now in use for the removal of stone from the bladder of the male patient. These will be described, with a view not only of enforcing those broad principles which are pretty generally, though, perhaps, not always sufficiently, recognized, as necessary to guide the surgical student, but of furnishing many useful practical details, which a considerable experience and careful observation of varied schools alone can supply.

An exposition of these, it is believed, may prove not without value in relation to Lithotomy, and to some debated questions in connection with it; while some important considerations, bearing on the operation of Lithotrity, will, it is believed, be discussed here for the first time. Lastly, the various modes of operating will be compared, and their merits discussed, with a view to determine the relative scope and applicability of each to the numerous and varied exigencies which are presented by calculous patients. The principles so deduced will be exemplified in practice by the recital of cases from my own experience selected for illustration.

And here I must be permitted to acknowledge the very many obligations which I have incurred, and the unusually valuable sources of information which have been kindly placed at my disposal during the prosecution of my task.

I am indebted to many of the best known hospital surgeons of this country for very complete and valuable information relating to nearly 1,500 cases, the value of which I can scarcely over-estimate, affording me a total of authentic reports from all sources respecting more than 2,300 cases, of which 1,800 are available for statistical purposes. (See p. 138 et seq.)

I have been entrusted by the son of the late Mr. Crichton, of Dundee, one of the most experienced and successful lithotomists in Great Britain, with the entire and unpublished notes of his practice. He cut, by the lateral method, during a career of about sixty years, upwards of

200 cases, and of most of them made valuable observations on the spot, and sometimes in considerable length and detail. These will be frequently referred to.

From Dr. Keith, of Aberdeen, whom I regard as possessing as large an experience as any man living in this country, since he has operated on more than 300 cases, I have received most important aid. For his extreme kindness in freely placing at my disposal the history of each one of these cases, and all the leading particulars respecting it, noted while the patient was under his care, my most grateful acknowledgments are due.

In Lithotrity, the unrivalled experience of Civiale, its renowned inventor and perfecter, has been unreservedly communicated to me on all occasions: and he has been especially desirous to afford me all the aid in his power in connection with my present task. I gladly seize the present opportunity of acknowledging to him my great and numerous obligations.

It has been my aim to embody in these pages as much as possible of the fruits of these experiences, added to that which I have myself personally enjoyed. The aim and scope of every portion of the work, as regards both its plan and execution, although I am very conscious of numerous shortcomings, will be to carry forward, from the outset of the first chapter to the final propositions of the last, a series of logical deductions from sound experience in relation to practice, and thus to verify the title which I have selected, viz. PRACTICAL LITHOTOMY and LITHOTRITY.

35, WIMPOLE STREET,
April, 1863.

PREFACE TO THE SECOND EDITION.

In preparing a second edition of this work, I have made considerable changes—removing old material, adding new, and compressing all as much as possible.

Increased experience has afforded me the opportunity of making many practical suggestions, which have been found useful in the management of calculous patients. The habit of carefully watching and making full notes of every case under my care, enables me to present in a brief and compact form the product of laborious inquiry as to the results of operative proceedings of different kinds. It is my intention to pursue this inquiry as earnestly and carefully as ever for some years to come, if circumstances permit, and in due time to present without reserve my entire experience to my professional brethren. To them I am deeply indebted for vast opportunities of study, which I regard as a precious trust, devolving upon me an onerous duty to them in return. Step by step, that duty shall be discharged to the best of my ability.

I have only now to state that three chapters are new, the 7th, 12th, and 13th. One chapter, the last of the old edition, has been removed altogether, and an Appendix, containing the histories of 204 consecutive cases of Lithotrity in the adult, occupies its place.

35, Wimpole Street,
Dec., 1870.

CONTENTS.

CHAPTER I.

LITHOTOMY: GENERAL CONSIDERATIONS RESPECTING IT.

PAGE

Lithotomy: various Modes of performing now employed.—Necessity for Variety.—Perineal Lithotomy may be Lateral or Central.—Description of Perineum.—Outlet of the Male Pelvis.—Its Boundaries and Measurements.—Dissection of Perineum from Skin to Neck of the Bladder.—The Parts cut in Lithotomy.—The Parts to be avoided 1

CHAPTER II.

THE LATERAL OPERATION OF LITHOTOMY.

The Instruments necessary.—Preliminary Proceedings; Assistants, &c.—The First Stage: Management of the Staff; finding the Stone.—Second Stage: the Incisions superficial and deep; Probe-pointed Knives; Gorgets; Lithotomes.—Third Stage: Removal of the Calculus.—Fourth Stage: the Tube; Treatment of Hæmorrhage, &c.—The after Treatment.—Aston Key's Operation 17

CHAPTER III.

THE OPERATIONS OF LITHOTOMY PERFORMED IN THE CENTRAL PORTION OF THE PERINEUM.

Numerous Attempts made to improve on Lateral Lithotomy.—The Bilateral Operation of Dupuytren.—The Medio-bilateral.—The Median.—Dr. Buchanan's Method.—The Recto-vesical Operation.—Modifications.—Cutting and Crushing combined.—Lithotomy as applied to Children . 58

CHAPTER IV.

THE SUPRAPUBIC OR HIGH OPERATION.

Origin of the Operation.—Method of Performing in Detail . . . 71

CHAPTER V.

CAUSES OF DEATH FOLLOWING LITHOTOMY.

PAGE

Causes of Death at different Ages must be considered separately.—Causes of Death in Adults.—Inflammation of Tissues around the Neck of the Bladder; and its Causes: most commonly due to Violence in withdrawing the Stone.—Urinary Infiltration; sometimes leading to Peritonitis; from Erysipelas, &c.—Cystitis; sometimes leading to Inflammation of the Kidneys or of the Peritoneum.—Absorption of Poisonous Products from the Urine.—Phlebitis and Pyæmia.—Shock.—Hæmorrhage and Exhaustion.—Tetanus.—Causes of Death in Children; why differing from the preceding.—Peritonitis: very rarely, Infiltration.—Exhaustion, &c. 76

CHAPTER VI.

DIFFICULTIES AND DANGERS MET WITH IN LITHOTOMY.

1. Difficulties and Dangers peculiar to the Age of the Patient—those of Infancy.—In Age, Rigidity of Tissues; Enlargement of Prostate, &c. 2. Difficulties from Personal Peculiarity in the Subject—Deep Perineum; Narrow Pelvis; Unusual Distribution of Arteries, &c. 3. Difficulties due to Peculiarity in the Stone—Size; Form; Number; Situation; Encysted Calculi.—Contraction of Bladder on Stone.—Calculi adhering to the Bladder.—Accidents—Wound of Rectum; Removal of Portion of Prostate; Fragments remaining after Operation; Secondary Hæmorrhage; Wound remaining Fistulous; Impotence; Incontinence of Urine; no Stone found at Operation 98

CHAPTER VII.

THE RESULTS OF LITHOTOMY.

My own Inquiry: embracing 1,827 Cases.—Complete Analyses of them.—Affords a True Result of Lateral Method before Lithotrity was general.—Results now will be wholly different.—Will vary according to the Proportion of Patients selected for each Operation.—Results of other Forms of Lithotomy 137

CHAPTER VIII.

LITHOTRITY.—INTRODUCTORY.

General Observations relative to its Rise and Progress.—The Importance of Treatment Preliminary to the Operation.—Its Nature, general and local . 149

CHAPTER IX.

THE OBJECTS OF LITHOTRITY, AND THE PRINCIPLES ON WHICH INSTRUMENTS SHOULD BE CONSTRUCTED IN ORDER TO ATTAIN THEM.

All Evil Results arise from Mechanical Lesion.—Lithotrites constructed so as to avoid this.—Lithotrites in two Classes: with Fenestrated Blades and Plain Blades.—Functions of the former and of the latter.—Mechanical Powers adopted: the Wheel and the Screw.—Lithotrites of different Kinds 156

CHAPTER X.

LITHOTRITY.—THE SYSTEMATIC APPLICATION OF IT IN THE VARIOUS STAGES OF THE OPERATION.

PAGE

Position of the Patient; ordinary and exceptional.—State of the Bladder; Injections.—Introducing the Lithotrite.—Finding the Stone; different Methods.—Crushing the Stone 173

CHAPTER XI.

LITHOTRITY, ITS SYSTEMATIC APPLICATION CONTINUED.

The Crushing and Removal of Fragments.—Various Modes of discovering and crushing the last Fragments.—Treatment following the Sitting.—Impacted Fragments.—Fever.—Cystitis.—Inflammation of the Kidney and Orchitis.—Hæmorrhage.—Retention.—Administration of Chloroform.—Lithotrity in Children 199

CHAPTER XII.

THE EMPLOYMENT OF LITHOTRITY IN CASES WHERE, BESIDES CALCULUS, SERIOUS ORGANIC DISEASE OR OTHER COMPLICATION EXISTS.

Lithotrity in—1. Organic Stricture of the Urethra.—2. Hypertrophy of Prostate.—3. Atony and Paralysis of the Bladder.—4. Sacculation of the Bladder.—5. Tumours of the Bladder.—6. Renal Disease.—7. Multiple Calculi 237

CHAPTER XIII.

THE RESULTS OF LITHOTRITY.

Difficulty of estimating the Results of Lithotrity.—Brodie's Experience.—Reports by Civiale.—The Author's Experience.—Its Results analyzed.—1. The Recovery Rate.—2. General Condition of Patients Afterwards.—3. The Return of the Malady 245

CHAPTER XIV.

ON THE CHOICE OF PROCEEDINGS BEST ADAPTED TO DIFFERENT CASES.

Importance of accurate Diagnosis.—Without it Choice of Operation impossible.—Sounding.—Classification of Stones.—Questions to be determined respecting the Stone.—1. The Age of the Patient—Results of Investigation; Ratio of Death at Different Ages in 1,827 Cases of the Lateral Operation, Metropolitan and Provincial; how affected by Age; Prevalence at different Ages.—2. Absence or Presence of Local Disease, their bearing on the Question of Operation.—3. Susceptibility to Constitutional Disturbance.—Final Deductions as to Choice of Operation for different Patients.—When not to operate.—Immense Importance of Detecting the Stone at an early Period 265

APPENDIX.

Brief Details of 204 Cases of Lithotrity occurring in the Practice of the Author 293

LITHOTOMY.

CHAPTER I.

LITHOTOMY: GENERAL CONSIDERATIONS RESPECTING IT.

Lithotomy: various Modes of performing now employed.—Necessity for Variety.—Perineal Lithotomy may be lateral or central.—Description of Perineum.—Outlet of the Male Pelvis.—Its Boundaries and Measurements.—Dissection of Perineum from Skin to Neck of the Bladder.—The Parts cut in Lithotomy.—The Parts to be avoided.

THE various operations which are employed for the Removal of Stone from the Bladder of the male subject may be arranged under two heads; viz:—

1. Those by which the stone is removed through an opening artificially made by the surgeon, either into the urethra or bladder; and comprehended under the term LITHOTOMY.

2. Those by which the stone is crushed in the bladder, and removed through the natural passage or urethra, without cutting; the process being in all cases sufficiently indicated by the general term LITHOTRITY.

I shall enter first upon the consideration of Lithotomy, as being the older operation, the most extensively known, and that which is generally best understood. It is to be regarded also as, perhaps, the most widely applicable operation, if all the cases of stone, in children and adults, are considered indiscriminately; although it is certainly not to be so regarded if adult cases are considered separately. This question, however, will be discussed at length in the proper place. Moreover, Lithotrity is better understood after the anatomical and surgical details of Lithotomy have become familiar to the mind, than when the converse order is pursued. Indeed, on many grounds it is advantageous to the student, in relation to both Lithotomy and Lithotrity, to make the study of the former precede that of the latter.

The subject of Lithotomy is by no means so simple and so limited at the present day, as it was considered to be a few years ago. If we take the writings of our best surgeons of the last fifty or sixty years, who have devoted themselves to it, we cannot but be struck with the fact that no other mode of performing Lithotomy is described or alluded to, except for occasional trial, or as a matter for speculative remark, than the Lateral Operation. Most assert that it is the only method which should be employed, except in certain circumstances, which are extremely unusual, and it is right to add that some great authorities appear still to hold the same opinion. The last twenty years, however, have witnessed some change in this respect in Great Britain, and several attempts have been made to remove the stone by other modes of incision; while the surgical practice of Paris has exhibited similar endeavours for a longer period of time. The introduction and progress of Lithotrity have in a great measure been the cause of this. Lithotrity has achieved such indisputable success with small stones, that those whose habits and inclinations lead them to prefer the use of the knife, have endeavoured to find a method of employing it which should compete on equal terms with the crushing operation. But where no such bias exists, almost all surgeons are now convinced that the difference between a large stone and a small one is so great, both as regards the prognosis of the case and the problem offered to the operator, that it is impossible to regard even all calculous patients who are to be submitted to the knife, as belonging to one category and as amenable but to one mode of the remedy. It is believed to be neither philosophical nor politic to apply to every stone, whether it weighs one drachm or three ounces, invariably one and the same proceeding. We have learned the importance, in the first place, of ascertaining, before deciding on any operation, the physical characters of the stone, that is to say, its size and hardness; and secondly, the condition of the patient in relation to the state of his urinary organs and his general susceptibilities. Hence the student of our subject in these modern times has several modes of Lithotomy to understand, and several questions presented to his consideration, in order that he may arrive at a practical solution of the question when any individual patient comes before him, viz. What is the best operation for this particular case?

Hence, also, it is that, up to the present time, there has been little attempt to offer a comprehensive appreciation of the various methods now in vogue. The choice has been mainly limited to the alternatives of Lateral Lithotomy and Lithotrity, with recently, in some quarters, the added resources of the Median Operation. An attempt to supply this desideratum will occupy the latter portion of this work.

The various procedures employed under the name of

Lithotomy must be arranged in two separate classes, viz.:—

First. Operations by which the bladder is reached from the perineum; and among these I shall notice six principal methods, which will sufficiently include all minor modifications.

Secondly. An operation performed above the pubes, and known as the High or Suprapubic Operation.

First. Operations performed in the perineum, or Perineal Lithotomy.

These are of various kinds, but all may be classified either as Lateral or as Central Operations.

Lateral Operations are those which are confined within one of the lateral divisions of the perineum. The incisions are directed between the central and lateral muscles of that region. They necessarily approach the pubic ramus, the pudic artery and its branches, and are directed transversely to these latter, near to their origin from the arterial trunks. They involve one side of the prostate gland, it may be nearly to its full extent, while in children, and in exceptional adult cases, they go beyond it.

Central Operations are those in which the incisions are limited to the central part of the perineum, and are made in the line of the raphé itself, or transverse to it, and lie mainly between the anus and the symphysis pubis. They do not approach the rami, or the great vessels, nor do they run transversely near to the origin of the branches from the pudic artery. In no case do the incisions reach the external limits of the prostate gland.

I. LATERAL OPERATIONS.—There is but one typical form of Lateral Lithotomy, although some of the details of its performance vary in different hands. It is the operation which is at present most widely employed in this country, and is well known as the Lateral Operation. Its origin is believed to be due to Pierre Franco, of Provence, about the middle of the sixteenth century. It was brought into note by Frère Jacques at the end of the seventeenth century; and was largely employed by his pupil Rau, in Holland, in the beginning of the eighteenth. The operation in its present form, however, differs somewhat from their methods, and is for the most part that which Cheselden adopted and practised in London with great success, in the early part of the last century, and which obtained for him a wide and enduring reputation.

II. CENTRAL OPERATIONS.—Belonging to this group there are at least five in number. 1st. The *Median Operation*. The stone was removed by a median incision in the perineum, made close to, and parallel with, the raphé in the old Marian Operation during the sixteenth century, and long afterwards. But the great improvement, and the far greater success which the lateral method realized, led ultimately to the total extinction of the Marian. The disastrous results of this procedure were due to the violent laceration of the neck of the bladder and posterior part of the urethra, by which room was made for the extraction of the stone, and not to the median incision of the urethra, which was all that the knife effected in that operation. This distinction was, nevertheless, lost sight of by most lithotomists (Ledran may be partially excepted*) until the Italian surgeons, at the commencement of the present century (Manzoni of Verona, then De Borsa, and subsequently Rizzioli) drew attention, by their success, to Lithotomy in the Median Line. Mr. Allarton brought it into notice in this country, publishing his own method of performing the operation and the results, in 1854. This plan has since been frequently tested by others, and has been generally spoken of here as Allarton's, or as the Median Operation. Dr. Buchanan's method, in which he uses an angular staff, first employed by him in 1847, may also be classed under the head of central operations, although it is capable of becoming a lateral operation when required.

---

* See not only his Parallèle, Paris, 1730, but Heister's testimony, Institutiones Chirurg., vol. ii. pp. 116–17, and 167; Amsterdam, 1739.

The *Bilateral Operation*, so named because the incisions, both external and internal, involved equally each side of the middle line, was designed and made public by Dupuytren in 1824. It was subsequently practised in Paris, by himself and others, for some years. As we shall see hereafter, it is, notwithstanding its name, a central, rather than a lateral, operation.

The *Medio-Bilateral*, a combination of the two preceding operations, as the term implies, was published by Civiale in 1836, having previously been practised by him, and subsequently both by himself and others, to some extent in France.

The *Recto-vesical Operation.*—This may be regarded as a continuation of the median operation from the perineum into the rectum, and is supposed to have been designed by Hoffman in 1791, though probably not practised by him. Sanson and Vacca are pre-eminent among those who performed and advocated it in the commencement of the present century.

In entering on the subject of Lithotomy performed in the perineum, whatever be the operation selected, it is necessary to study closely the anatomy of that region. It would, however, be superfluous to enter upon any systematic or minute examination of it here, but I shall call attention to one or two points relating to what is usually termed its surgical anatomy, which appear to me to be important.

A body is supposed to be tied up in the usual Lithotomy position, to expose the perineal region : a region, let it be recollected, *in which deep incisions* are to be made, *and through which* the stone is to be extracted.

It is important to keep steadily in view these two indications, since *the region contains vital organs, and is very limited in extent.*

Therefore—*a.* The incisions must be planned so as to avoid certain parts which it is dangerous to cut ; and—

b. They must be planned so as to secure the greatest amount of space for the passage of instruments inwards and of the stone outwards.

The perineal region is a small space, measuring rarely much more than four inches in any direction, as generally regarded, and its limits are defined in the greater part of its extent by bone. Beneath its surface are the rectum, urethra, bulb, prostate gland, bladder, and the pudic artery, with some of its branches, besides less important parts.

Its surface boundaries are often said to present a space of triangular form ; the apex at the pubic arch ; the base, a horizontal line uniting the two tuberosities of the ischium. Such a triangle is nearly equilateral, and each of its sides measures in the adult about three inches in length. Such a representation may be convenient to the anatomist, but it is artificial, and for the surgeon not practically true.

Sometimes the space is said to be lozenge-shaped, in which case the anatomist includes under the term not only the space above described, but another triangular portion, having the same base as the preceding, and the apex at the coccyx; the latter region covering in the lower part of the rectum and the ischio-rectal fossæ.

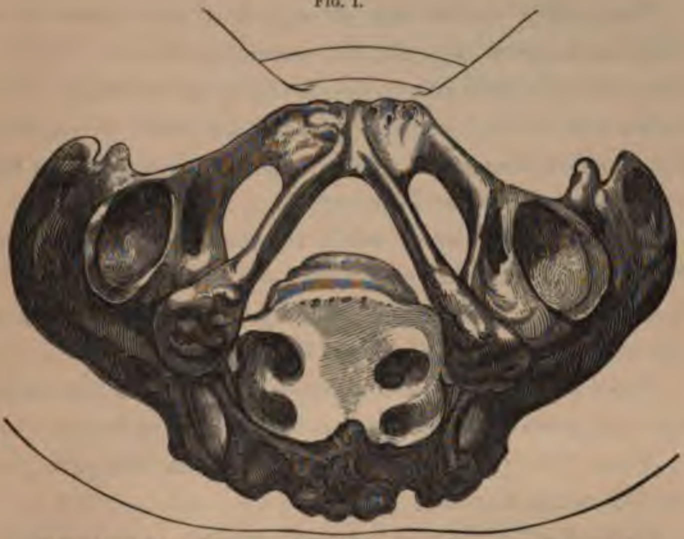
Now, the surgeon should study for his purposes the anatomy of the male pelvic outlet as a whole, just as the obstetrician has studied that of the female. He wants to know precisely what are the size and form of that outlet, as well as how the important organs are disposed therein. Neither the triangle nor the lozenge rightly represent it in relation to his requirements; while the division of the region into two separate portions for the sake of dissection is unfavourable to the formation of a correct conception of it as a whole. Furthermore, the surgical student must soon perceive that neither of the two regions thus annexed include space enough, either for the first incision required in the lateral operation, or for the removal of a moderately large stone outwards.

The true form of the male pelvic outlet, and consequently that with which we have to do, is that of the conventional heart; the ace of hearts, with the apex upwards.

Take the skeleton of an adult male pelvis, in which the bones are united by their ligaments, and place it in the position for lithotomy. Such an one is faithfully represented by fig. 1.

The apex of the inverted heart is at the lower border of the pubic symphysis; the diverging sides are the rami of the pubes and ischia; the rounded lobes of the heart are defined by the great sacrosciatic ligament, and the notch dividing them is formed by the tip of the coccyx.

FIG. 1.



Pelvic bones in the ordinary position of Lithotomy, showing form of outlet.

FIG. 2.

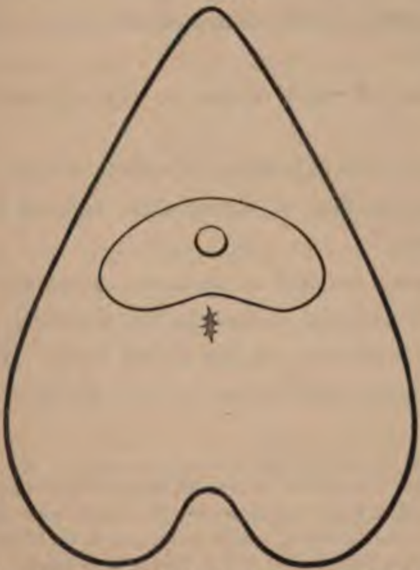


Diagram of the male pelvic outlet, showing the situation of the prostate urethra and anus: drawn on a scale of two-thirds of the natural size.

The pelvic outlet thus described is represented in a diagram adjacent (fig. 2); but accurately drawn from the skeleton, on a scale of two-thirds of the natural size. This figure will be employed to represent the outlet throughout this work in connection with the incisions employed in the various operations for Lithotomy.

In a well-developed adult the measurements of this heart-shaped space are as follows :—

From apex under pubic symphysis to the interlobular notch at the os coccygis, about 3¾ to 4 inches.

From the anterior part of one tuber ischii to the corresponding part of the opposite bone, about 3 inches.

From the apex to each tuber ischii at the part just named, about 3 inches.

Consequently, the two last measurements include a right-angled triangle—the perineal triangle of the anatomist.

From the apex to the centre of the anal orifice, about 2½ to 2⅝ inches.

From centre of anal orifice to tip of coccyx, about 1¼ to 1⅜.

From the apex to extremity of either lobe of the heart-shaped space, the line of incision in Lateral Lithotomy, about 4½ inches.*

To commence: we will suppose an examination of the region on an untouched subject in the dissecting-room; or, better still, as it appears on the living body. First, there are the projecting tuberosities of the ischium, and from these the upward converging lines of the rami may be traced by the fingers near to the apex, where they are obscured by the body of the penis overlaying them as they approach it. Then, about an inch and a quarter below the anal orifice, may be felt the coccyx, and on each side the fingers deeply pressed encounter nothing but soft structures occupying the spaces indicated by the rounded lobes of the heart-shaped figure. In the middle line above the anus, is seen a slight prominence caused by the corpus cavernosum and its enveloping muscle, and placed vertically upon it is the line of the raphé, which divides the region into two equal lateral portions. The anus itself is situated in a deep depression, and a transverse line drawn from the centre of one tuber ischii to another falls just above it.

---

* In some bodies the pelvic outlet is more contracted or narrower than the above measurements; the distance between the tubera ischii being in the adult only 2¾ inches, and in a few instances only 2½. This latter condition offers some obstruction to the removal of a large stone, and if the lateral operation is adopted in such a case, its line must be less oblique than usual. *Vide* Chapter VI. "Difficulties Arising from a Narrow Pelvis."

Observe, that the sides of this space, from the apex to the tuberosities of the ischium, are bone; and that the interlobular notch of "the heart" is bone also; boundaries, therefore, which yield nothing to pressure, and cannot be overstepped by incision. But, on either side of the notch, the tissues are soft and yielding; and incisions in the long axis of either lobe divide no important structure. Danger exists only at the external boundary, in the presence of the pudic artery; in the upper part, from that of the artery to the bulb; and in the central line, from the presence of the bulb itself and the rectum. It is through one of these lobes, and precisely in the direction of its longest axis, that the external incision in Lateral Lithotomy is made; and, which is of equal consequence, it is in the direction of that axis that traction must be exerted when the stone is of large size. It is in the upper and narrower division of the outlet, viz. that between the anus and the symphysis pubis, that the incisions lie, in all operations which are strictly central, and traction is made directly in the middle line from the perineum to the operator. It can be demonstrated that it is impossible to remove so large a body through an incision confined to this portion of the outlet, and not involving the rectum, as through an incision in the axis of the lateral portion.

Now, every proposal to perform Lithotomy in the perineum must first be tested as to the relation which its incisions bear to the outlet thus described; since, as we shall see hereafter, there is no single cause of death or danger following Lithotomy, greater than that which ensues from the removal of a stone through an insufficient or an ill-placed opening.

Bearing in mind the form of the space, let us proceed to make a surgical, not a minute or anatomical, dissection of it. The latter is necessary in its place, but that is not here. We want now only the salient points, to refresh the memory, not to encumber it with non-essentials.

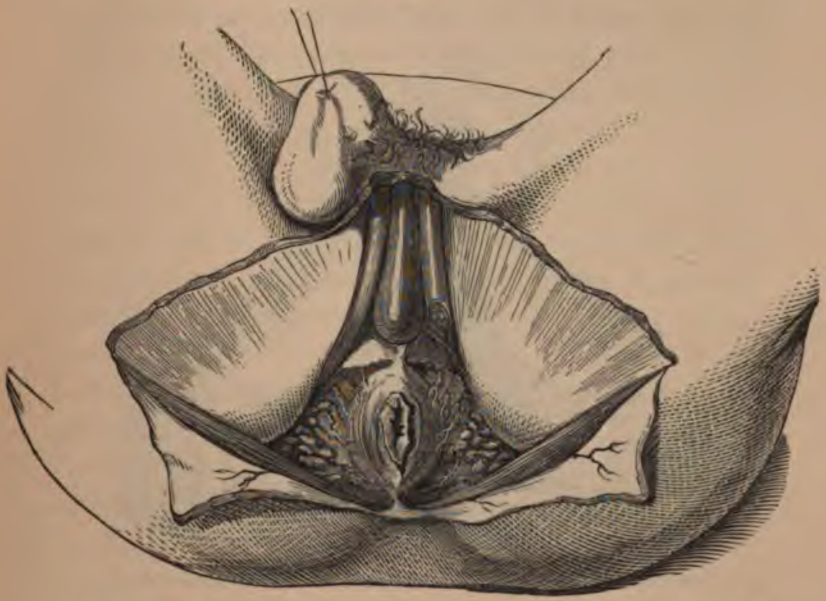
Without entering on the details of the process, let it be supposed that the skin, cellular tissue, and fat are removed: this completes the first stage of dissection.

The accelerator urinæ muscle occupies the middle line at the top of the space, and the sphincter ani surrounding the end of the rectum continues the line below it. The space is crossed transversely by the two transversus perinei muscles; and the erector penis lying on the pubic ramus of each side, forms one side of a triangle, of which the transverse muscle is the base, and the accelerator the remaining side. From this are seen issuing the superficial perineal artery and nerve, with their branches. Below the transverse muscle is the ischio-rectal fossa, with a few unimportant branches of artery and nerve permeating it.

The central point of the perineum is seen between the bulb and anus, where the four muscles unite in a crucial form. All these are superficial to the triangular ligament, or deep fascia, of the perineum.

The next stage of the dissection removes these muscles, and exposes the corpus spongiosum and the corpora cavernosa of the penis: the deep perineal fascia is seen in the intervals. Here (as represented at fig. 3) it is left untouched on the right side of the subject, while it is removed, together with the compressor urethræ muscle, on the left, to show the course of the pudic artery, and its branch the artery to the bulb, which lie beneath it, the latter perforating the fascia. The left corpus cavernosum is also divided to show the arteries more clearly. The

FIG. 3.

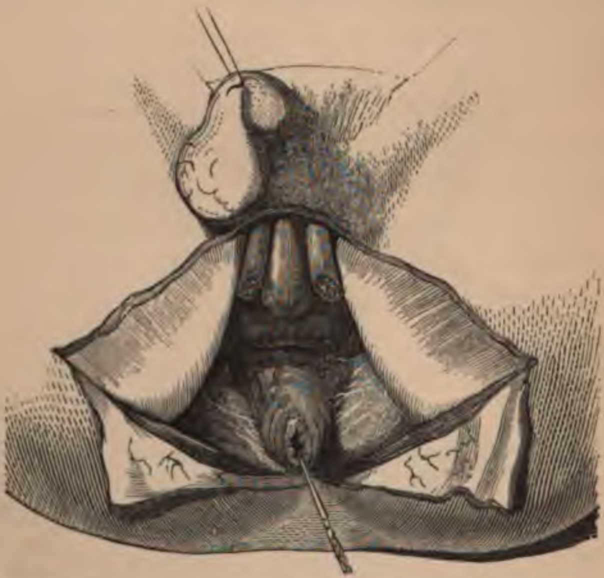


The second stage of the dissection of the perineum, showing the course of the pudic artery, and artery to the bulb, the fasciæ, &c.

position of these vessels forms the important point of this dissection.

The last stage of the process consists in clearing away the whole of the perineal fascia, the vessels just named, and the deep fascia, now usually known as the pelvic fascia, which lies beneath the vessels, and forms a sheath for the prostate gland. The fibres of the levator ani having been divided on each side, the rectum is drawn downwards, and carefully separated from the prostate, maintaining the latter as much as possible in its normal position. To illustrate the situation of this organ and neck of the bladder is the object of this, the last, dissection. The result is shown by fig. 4.

FIG. 4.



Deep dissection, showing the situation of the prostate in the pelvic outlet.

After this brief anatomical *résumé*, it will be easy to see what parts must be divided in the various modes of operating in this region.

In Lateral Lithotomy the following parts *must be cut.* —The skin and superficial fascia; the transverse muscle of the perineum and transverse perineal artery; the deep perineal fascia, the membranous urethra, and muscular fibres surrounding it; a little of the levator ani, the prostatic urethra, and part of the prostate gland itself. In addition to these, the following parts may be, and often are, cut:—a part of the accelerator urinæ muscle covering the bulb of the urethra, and a little of the bulb itself; also the internal meatus at the neck of the bladder. Occasionally, especially when the vessel is given off lower down than usual, the artery to the bulb is divided also.

In Central Lithotomy the following parts *must be cut.* —The skin and superficial fascia; the tendinous structures which unite the muscles in the central point of the perineum, and a few fibres of the accelerator urinæ muscle. Some small arterial branches anastomosing across the middle line. The deep fascia, the membranous urethra, and muscular fibres surrounding it; the prostatic urethra, and a little of the lower part of the prostate gland itself. In addition to these, the bulb of the urethra is generally divided to a small extent; and when deep lateral incisions are made also, the prostate gland is divided in the direction named, with a little of the deep fascia right and left of the median line and the muscular structure contiguous to it, as well as the internal meatus, according to the design of the operator.

Further: it will appear that, in order to introduce any large instrument, or to remove any large body by the Lateral Operation, room must be provided in the direction of the lower angle of the wound. The pubic arch limits the space unalterably, in front, the ramus of the ischium equally so on the outer side; the rectum and coccyx occupy the middle line. Hence, in withdrawing a large stone from the bladder, traction must be made obliquely downwards and to the right side of the operator in the direction of least resistance, which is towards the hollow of the sacrosciatic ligaments, where the fibres of the gluteus muscle only cross the heart-shaped space which has been already indicated as forming the true outlet of the male pelvis.

Lastly: it will be equally obvious, that in the performance of Lateral Lithotomy, the following parts *are to be avoided.* In front, the artery to the bulb, and the bulb itself. In the median line, the rectum. On the outer side the pudic artery; which, however, could only be endangered by the most reckless incisions; still, its situation, at the margin of the ramus bounding the space there, is always to be remembered. In the last or deepest incision the boundary limit of the prostate is not to be overstepped in the adult, whenever the stone can be removed without doing so; but this point will be discussed at length when we consider the steps of the operation itself.

In central operations (the recto-vesical excepted) the rectum must be avoided in the lower part of the incisions; and it should be the aim of the operator to avoid the bulb above, or to wound it as little as possible. Respecting incisions in the prostate, as in the preceding case, more will be said hereafter.

CHAPTER II.

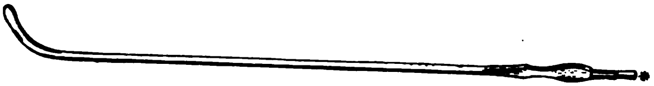
THE LATERAL OPERATION OF LITHOTOMY.

The Instruments necessary.—Preliminary Proceedings; Assistants, &c.—The First Stage: Management of the Staff; finding the Stone.—Second Stage: the Incisions superficial and deep; probe-pointed Knives; Gorgets; Lithotomes.—Third Stage: Removal of the Calculus.—Fourth Stage: the Tube; Treatment of Hæmorrhage, &c.—The after Treatment.—Aston Key's Operation.

I SHALL first enumerate the instruments which it is desirable to have ready for use before performing the operation of Lithotomy by the lateral method. The non-appearance of a single instrument of importance at the moment it is required may produce great embarrassment to the operator; hence a list should be at hand by which the instruments can be selected the day before the operation.

Sounds of the proper form for detecting stone in the bladder (fig. 5).

FIG. 5.



An eight-ounce syringe (fig. 6), with suitable catheter for injecting by urethra; and a tube for washing out the bladder by a reversed current through the wound after the operation (fig. 7).*

FIG. 6.

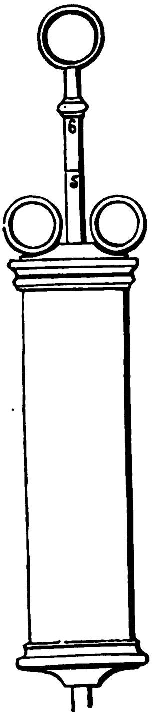


FIG. 7.

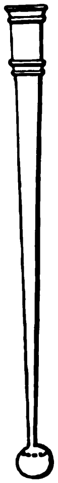


FIG. 8.

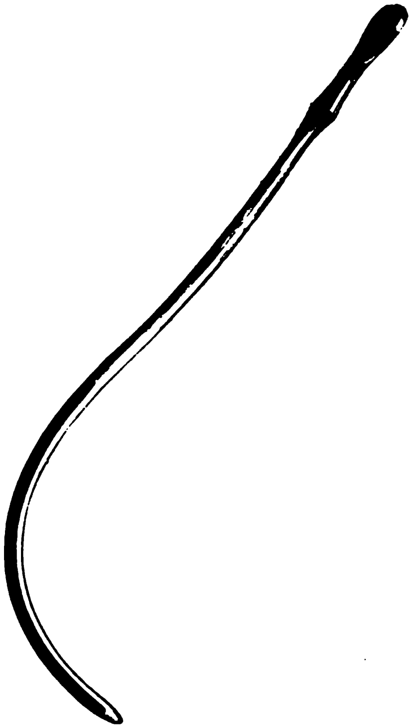


Fig. 6. The syringe, with graduated piston rod.
Fig. 7. Nozzle for reversed current.
Fig. 8. Staff, with lateral groove.

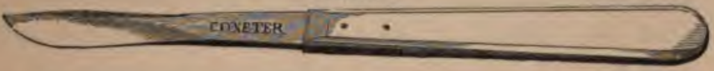
Full-sized staffs, as deeply and widely grooved as their size admits, consistently with maintaining their strength. The groove to be midway between the convex and the lateral aspects of the staff, to stop abruptly half an inch from the extremity, and not to extend so far up the handle as to permit the urine to escape (fig. 8).

---

* This nozzle is after the suggestion of Dr. Gross of Louisville, Urinary Organs, 2nd ed., p. 560.

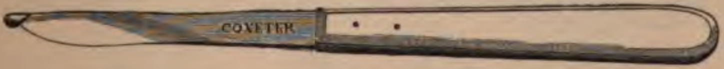
A knife, of which the blade and handle together measure (for the adult) about 7½ inches long; of this, the blade may be about 3 or 3¼ inches. The cutting edge should have a length of about one inch from the point: for form, &c., see fig. 9. Smaller sizes are required for young subjects.

FIG. 9.



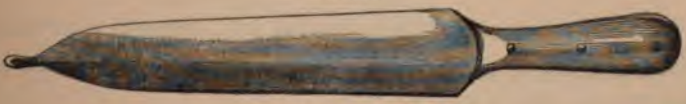
A second knife, of which the blade and handle may measure together about 8 inches; of this the blade may be about 3½ inches. A large probe point should terminate the blade, and it should be so constructed that it may run easily in the groove of the staff. The cutting edge should extend to about 1¼ inch from the point (fig. 10).

FIG. 10.



A blunt gorget about 5½ inches long, exclusive of the handle, curved from side to side and terminated by a probe point, to run in the staff (fig. 11). This is a useful

FIG. 11.



See other gorgets at p. 36.

instrument where the perineum is so deep, or the prostate so large, that the finger cannot reach the bladder, as occasionally, but rarely, happens.

Forceps of various forms and sizes. It is desirable to have the blades of good length, so that the angle produced by opening them is acute rather than the reverse: a better form of wedge is thus presented to the orifice, through which the instrument and the stone have to pass. The inner surfaces of the blades should be slightly roughened; they are sometimes lined with very thin canvas or kid leather, to afford a surer hold, and avoid any crushing of the stone itself. The extremities of the blades must not meet; an interval of about one-eighth of an inch should exist between them when the instrument is closed. It is necessary to have curved as well as straight forceps. (Useful forms are shown at figs. 12 and 13.)

FIG. 12.

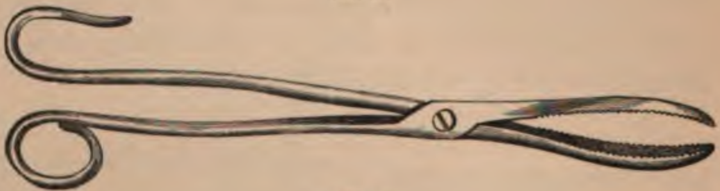
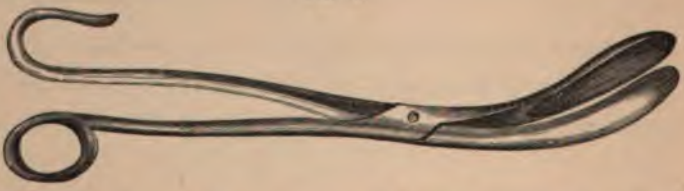
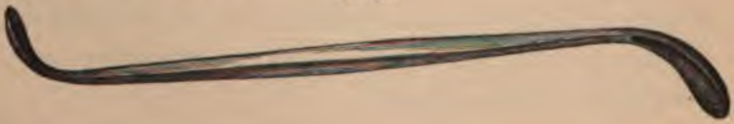


FIG. 13.



A scoop is sometimes very useful, and succeeds in certain circumstances in removing a stone or fragments, better than the forceps (fig. 14).

FIG. 14.



An instrument for searching the bladder after the operation, in case another calculus or fragments may still remain there. Nothing answers better than the sound represented at fig. 5.

A strong instrument for crushing a calculus of unusually large size, and requiring to be broken before removal, is occasionally necessary. Several forms have been designed, but almost all consist of a pair of ordinary strong forceps, with screw or other power to approximate the handles. (See Chapter VI.)

A pair of worsted web lithotomy garters, strong, but pliant; each measuring not less than three yards. An anklet, to accomplish more easily and more securely the same purpose, has been designed and employed by Mr. Prichard, of Bristol. (Figs. 15 and 16.)

FIG. 15.

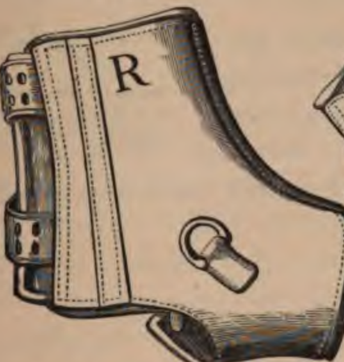


Fig. 15. Mr. Prichard's anklet.

FIG. 16.

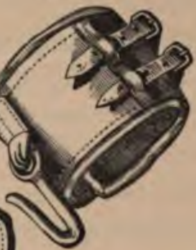
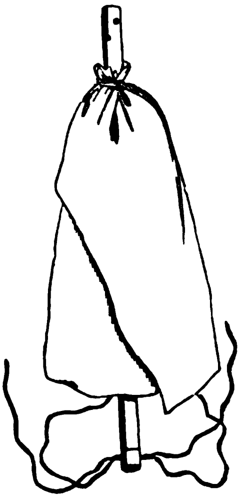


Fig. 16. The wrist-piece.

His description is as follows:—"These straps consist of padded leather bracelets fitting to the wrists, and buckling firmly round them; and some firm leather anklets, of the shape of the elastic bandages for the ankles, which can be buckled on over the ankles. The bracelets have a strong hook on the middle of their palmar aspect, and opposite each outer malleolus is an iron ring. The bracelets and anklets being put on when the patient is in bed, as soon as he is under chloroform, or the staff is introduced, the hooks are passed through the rings and all is done."* I have used these anklets for some years, and much prefer them to the garters, as being more simple and secure.

FIG. 17.

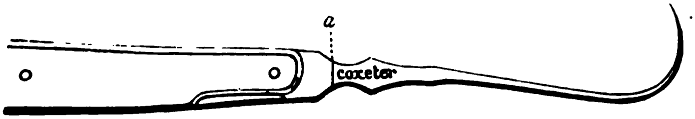


The tube surrounded with a piece of thin calico, or oiled silk, to retain the plugging in case of hæmorrhage.

A tube to be introduced through the wound into the bladder, after the operation, if desired. One may be specially fitted for plugging in case of deep venous hæmorrhage. (Fig. 17.)

Ligatures; artery forceps; curved needles and strong silk, tenaculum (fig. 18) to secure any deeply-seated arteries (see Treatment following the operation under the head Hæmorrhage, page 43); bandages, sponges, lint.

FIG. 18.



Tenaculum (Dr. Keith). At *a*, the hook unites with the handle by a screw, and can be separated from it, for the purpose of leaving it in the wound beneath a deep-seated vessel after tying round it, when the ligature cannot be secured otherwise.

Other appliances.—Vessels containing hot and cold water, one of the former to heat the forceps and other instruments; napkins in abundance, oil; chloroform is of course to be given. Brandy, wine, smelling salts, and chloric ether, or sal volatile, should always be within reach.

---

* Brit. Med. Journal, Dec. 22, 1860, p. 993.

The operator should himself see that there is a strong, firm, and steady table, of proper size, and capable of being placed in a good light. The table should be 2 feet 8 or 9 inches high, if the operator is seated in a chair of ordinary height; but a table of almost any height will do, if the relative proportion between it and the chair be maintained. The operator should be seated rather too low than too high. The fore-arms should not occupy a horizontal line when operating, but incline upwards to the patient's perineum. Some surgeons prefer the kneeling position, with one, or even both knees resting on the floor. A blanket folded once or twice, and covered with some waterproof cloth, should be placed on the end of the table, over which the patient's buttocks will be brought. Pillows or cushions will be required to support the head and shoulders. A shallow vessel containing sand or sawdust is useful to protect the floor from blood, urine, &c.

THE OPERATION.—It is usual to ensure action of the bowels by an aperient, on the day before the operation; if, however, they have been regularly and sufficiently moved in the natural manner, a purge is undesirable, since it only weakens the patient. But on the day of the operation, and about two or three hours previous to it, a full enema of warm water should be given. The surgeon should ascertain that the action of this has been efficient and completed at least an hour before the operation, or he may find the rectum distended, and about to act when the patient is on the table; a condition in which the chances of wounding the bowel are augmented. By pursuing this method time is also given for a few ounces of water to collect in the bladder if desired, which would probably have been emptied simultaneously with the bowels. The left side of the perineum may be previously shaved with a common scalpel or a razor.

[Some surgeons, and especially at the present day, regard it as important that there should be a considerable quantity of water in the bladder. I venture to express an opinion that its use is overrated; and that it is sufficient to take the chance of the urine accumulating for an hour before the operation; at all events, any attempt to inject an irritable bladder is rarely of any service. Cheselden expressly says that he prefers the bladder empty, as the stone is then sure to be found close to the internal incision at the neck; whereas if the organ is full it may entangle the stone in its folds as it collapses. Mr. Crichton, of Dundee, was of the same opinion, and insists, in his MS. notes, that if the bladder is empty, or nearly so, the stone is certainly found at the neck of the bladder.]

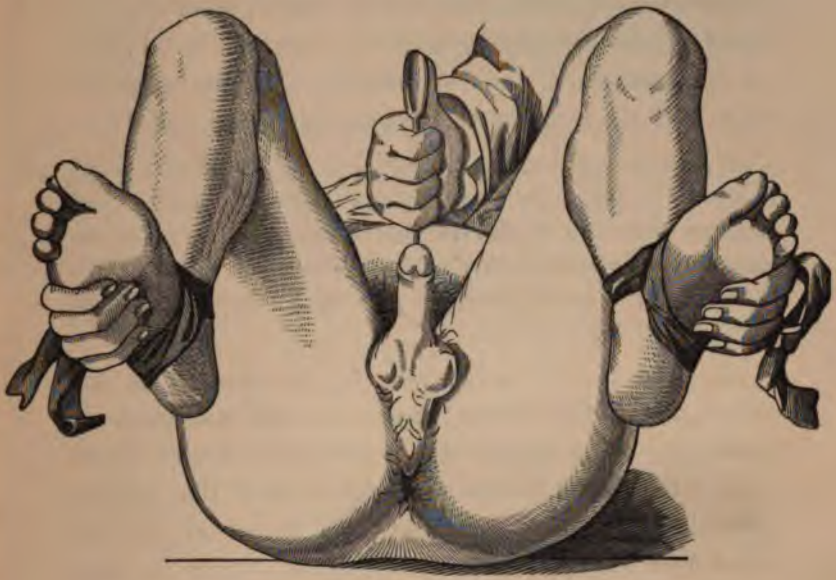
ASSISTANTS.—There should be one steady, experienced assistant to hold the staff; it is his duty to follow implicitly the operator's instructions throughout. Two others also are necessary, each to support firmly a leg of the patient; one of them to draw the scrotum a little upwards, and to the right side; or this may be done by the assistant who holds the staff. These suffice, in addition to the physician who administers the chloroform. Another may be sometimes useful to hand sponges, ligatures, &c., or to supply any want of the patient; all of which, however, may be done if need be by a nurse. The instruments should be carefully arranged by the operator himself (on a tray or otherwise), within easy reach of his right hand, so as not to be touched, and possibly deranged, by an assistant.

I. All the preliminary arrangements being complete, the patient should be placed on the operating table, and be sufficiently covered with blankets. Chloroform having been administered, the staff should be carefully introduced, and the stone found, and struck by it if possible, the click being heard by the operator, and by one other person at least. If it cannot be felt with the staff, a sound of the proper form should be introduced, the bladder explored, and unmistakable signs of the presence of calculus elicited. It may be necessary in order to discover it, to inject a little warm water, particularly if the bladder has emptied itself during the sounding. If, after a fair search, the stone is neither heard nor felt, no operation can take place, and the search must be resumed on another day.

[But it is very desirable, and in most instances it is possible, to strike the stone with the *staff itself, upon which the patient is to be cut*. Because, supposing the stone to be struck with the ordinary sound, and some difficulty is experienced in passing the staff subsequently, it is possible that the operator has made a false passage, and unwittingly passed the instrument out of the urethra altogether. Or, the staff may have passed into an old false passage, which the sound, having a different curve, escaped. The obvious consequence is, that any operation performed on a staff so placed will not lead into the bladder, no stone will be removed, and the discovery of the error may not take place until it is too late to repair it. This unhappy accident has been known to occur, not very unfrequently, particularly in children. It could not happen if the surgeon were determined to hear the stone struck with the staff itself; and, especially if he has not had much experience, nothing else should satisfy him. An experienced surgeon knows whether the staff is in the bladder, without feeling actual contact with the stone, by the degree of mobility possessed by an instrument rightly passed, strongly contrasting with its fixed condition, when passed out of the urethra; but the rule laid down should be considered always binding. It is especially necessary in young cases, because a staff passed into the cellular interval existing between the rectum and bladder, has often a good deal of mobility, and thus is believed to be in the vesical cavity.]

The staff being placed in the bladder, the patient's head and shoulders should be a little raised by two or three pillows, and the hand and foot of each side made fast by means of the anklets described. If the garter is still preferred, it is to be used as follows:—An assistant extends the right arm by the patient's side, and drawing up the right foot by flexing as much as possible the knee and hip joints, places it in the hand so that the palm embraces the outer side of the instep, and the fingers lie transversely below the sole, with the thumb across the dorsum. The garter is then folded double, with a running noose at the doubled end, which is placed round the wrist; the two free ends are crossed tightly under the sole and round the ankle, so as not to slip, and finally are tied with a bow on the outer side. Meantime the opposite limb is similarly treated. When all is made secure the buttocks are brought down until they project slightly over the edge of the table (fig. 19). Each leg is firmly and steadily held by an assistant, who, facing the operator, places his nearest hand (*e. g.* his left if standing on the patient's right) on the inner side of the patient's knee, while his other grasps the patient's foot, keeping it well backwards and outwards. The staff is confided to an assistant who stands on the patient's left, and takes it in his own right hand. He should hold it so that the handle is perpendicular and strictly in the middle line,

FIG. 19.



The position of the patient when tied up for Lithotomy.

neither deviating to the right nor to the left; and as there must necessarily be some base of support in so doing, it should be made to rest steadily but lightly against the lower border of the symphysis pubis. In this position, about two inches of the staff ought to be lodged in the bladder. With his left hand he may gently draw up the scrotum a little towards the right groin, and so keep it out of the way.

The operator, having placed the necessary instruments within his reach, takes his seat and separates the legs as much as he deems necessary to expose sufficiently the perineum and part of the buttocks adjacent. He ascertains that the position is square to the front, and that the patient is firmly placed.

By a glance, and by passing the fingers over the perineal surface, he observes whether the tubera ischii are wide apart, or whether they approximate more than usual; and he plans the line of the first incision somewhat in conformity with the result of his examination. (See page 10.)

[Different authorities give different directions respecting the mode of holding the staff. Some prefer the convex part slightly projecting in the left side of the perineum; but the instructions given above describe the method which at the present day is pretty generally pursued by most experienced operators in this country.]

II. The operator commences by introducing his left forefinger into the rectum to ascertain that it is empty; a proceeding which appears also to have the effect of stimulating the bowel to contract and occupy the smallest possible space. He then places the fingers of the left hand upon the upper part of the perineal region to maintain the skin in its place, not to draw it upwards; and holding the sharp-pointed knife in his right, commences the first incision about a quarter of an inch to the left of the raphé, and an inch and quarter to an inch and half in front of the anus, carrying the blade downwards and outwards for about three inches in a direction about midway between the anus and tuber ischii, but inclining a little nearer to the latter. The knife should, at its point of entry, divide the skin, and quickly sink more deeply towards the staff, the situation of which should be kept in the mind's eye, into the superficial fascia and fat in the hollow which exists between the bulb and anus on the one side, and the ramus of the ischium on the other; this fossa corresponds, therefore, to about the upper half of the incision, which is to be gradually made more superficial through its lower part. If a large stone is anticipated its entire length may extend to about three and a half inches. As a rule, then, the first incision should be free.

[The line of the first incision is somewhat differently taken by different operators. Nearly all agree to commence a little to the left of the raphé, but not so in regard to the distance in front of the anus. Thus, Sir William Fergusson directs that it should commence one inch and three quarters in front. Mr. Erichsen one and a half inch, Sir B. Brodie, Mr. Stanley, Mr. Skey, and Dr. Gross, advise one inch and a quarter, while Mr. Coulson and Dr. Keith of Aberdeen direct that it should be one inch only in advance. The latter attaches considerable importance to this point, and argues in its favour at some length in his work on the subject.* Mr. Crichton always made his incisions low: I infer from his notes, as near as possible to the last-named spot.

It is quite clear, also, that Cheselden, himself, commenced about one inch in advance of the anus.†

The directions given by other well-known operators are not expressed in precise terms, and on this account they are not quoted. Now, as it appears that nearly all advise an external incision of about the same length, that is, of three inches or thereabouts for an adult patient, it follows that the situation of the opening relatively to the pubic arch and to the bladder must differ, and somewhat materially. This discrepancy has sometimes been the source of perplexity to the student; although it is true that where the incisions are commenced high up, the skin only is cut at first, and where they are low, the knife is made to penetrate into subjacent tissues at once, so that, in any case, the deepest part of the incision is made into the hollow between the accelerator and the erector penis muscles, just beneath and outside the bulb of the urethra.

---

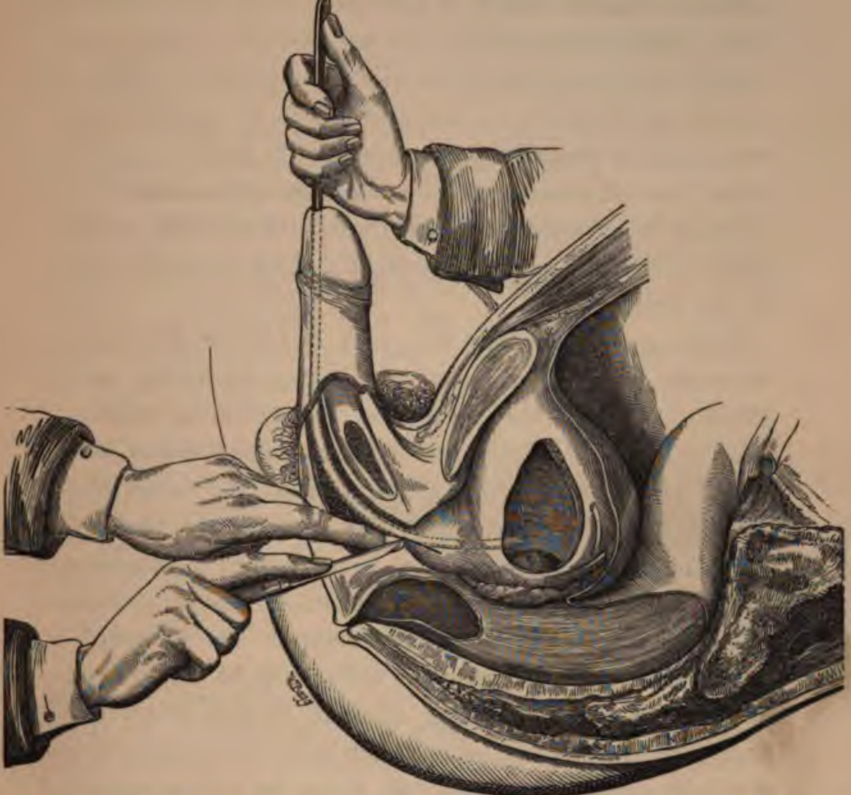
* Hospital Statistics of Stone, pp. 17–21. By Dr. Keith, Aberdeen, 1849.

† Cheselden's Anatomy of the Human Body. 5th ed. 1740; 6th ed. 1750. "I first make as long an incision as I can, *beginning near the place where the old operation ends.*"

Nevertheless, it is the safer practice to err, if it be an error, by placing the incision too low rather than too high. The low incision avoids the bulb and the artery thereto; it enters the urethra in the membranous portion, or just at the apex of the prostate; and it places the axis of the wound in its best relation to the pubic arch, that is, as far as possible from that unyielding boundary of the perineal space. It thus affords room for removing a large stone, and lessens the chance of bruising the neck of the bladder with its external cellular relations in the act of extraction, the danger of which will be pointed out in Chapters V. and VI. But it is not to be overlooked that the lower the incision is placed, the more danger there is of wounding the rectum: and especially so, if the operator overlooks the necessity for commencing at a little greater distance from the raphé, when he enters the knife at an inch or inch and quarter, instead of an inch and three quarters above the anus.]

The left forefinger now enters the wound and separates a little, especially at its deeper part, the fat and fascia in the direction of the staff, which should at this stage be just felt beneath them, guarding, at the same time, the rectum by pressure downwards and inwards, while the knife follows, and by an additional small stroke or two enables the operator to define clearly the line of the staff, and press his finger-nail into the groove where it lies in the membranous portion of the urethra just in front of the apex of the prostate. Guided by the nail, he carries the point of the knife into the groove at this spot, and he holds the knife so that the blade is neither vertical nor horizontal, but inclining rather more to the latter direction, while the point is directed a little upward. This important stage of the operation is illustrated by the annexed woodcut (fig. 20), in which the parts are shown by an anatomical section. The knife is now pushed steadily

FIG. 20.



Anatomy, in section, of parts interested in Lithotomy. Position of hands in last incision. [Mr. Bagg has represented this for me very carefully, from a dissection made expressly for the purpose.]

along the groove of the staff into the bladder, the operator being careful to remember that the depth of the incision in the prostate very much depends on the angle which the blade makes with the staff in that act. The hand, therefore, must not be lowered too much ; if a small incision is required, the knife is to be maintained very nearly in a line with the extremity of the staff, so as to make an acute angle with it; the point being kept up only enough to insure its transit clearly and closely along the groove, which must not be quitted for an instant. When the bladder has been entered, the knife is withdrawn to make way for the finger, but if the operator is of opinion that more room is wanted he can enlarge the incision to the extent deemed necessary while withdrawing the blade, by carrying it outwards and downwards, in the line of its entry, so that the edge sweeps lightly along the outer angle of the wound.

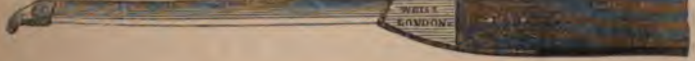
The operator now slips the point of his left forefinger into the groove of the staff, and along it, slowly and steadily through the wound in the prostate, slightly dilating it as it passes, until the last joint enters the vesical cavity (as it will in ordinary cases), and comes into contact with the stone, mostly felt lying at the neck of the bladder. In this position he is enabled to ascertain its situation, and, at the same time, to make a kind of hold upon the bladder, and maintain his communication with it. He now orders the staff to be withdrawn, and taking a pair of long straight forceps, introduces it by sliding the wedge-shaped extremity very slowly and gradually outside the finger, but along its palmar aspect, until the blades are fairly within the bladder. It is manifest that additional dilatation of the wound in the prostate must be made in this act; and it is a matter of the highest importance that the forceps should not be thrust in so as to form a rent in the soft tissues, but that the operator should coolly, deliberately, and slowly insinuate them in order to dilate gradually as much as may be necessary, and rupture as little as possible. Meantime a little of the urine will probably escape by the wound.

[The mode of making the last or deep incision through the prostate and neck of the bladder is one which has been at all times regarded as possessing the highest interest for the lithotomist, and demands special attention. It has been described here as made with the sharp-pointed knife employed in the earlier stage of the proceeding. Such appears to be on the whole the prevailing practice among metropolitan operators. Nevertheless, other means, and a great variety of instruments, have been largely and are still employed in its performance, for the purpose of attaining, as it is believed by those who advocate them, more safety and certainty in the incision. Two principles of construction, and two only, have been adopted in the numerous forms of knife, bistoury, or gorget, which have been invented from time to time in order to accomplish this end. The first principle has been to give the instrument, whatever its form or name, a blunt probe-point, which shall run easily along the groove of the staff, and be incapable of doing mischief if by mishap it gets out of it. The other principle of construction consists in giving to the blade of the cutting instrument such a width as to determine the exact depth of the incision intended; to ensure that this depth shall not depend on the will, and manipulative execution of the moment exercised by the operator, which may of course vary, but solely on the prearranged depth of the blade itself.

These principles serve to classify all the very numerous instruments referred to, and reduce them to a position in which we can consider their merits.

The instrument which illustrates the first class is the simple probe-pointed knife, or bistoury; one of the earliest and best-known forms being that of Sir Wm. Blizard, whose name it still bears (fig. 21). This, or some other form of it, of which several are exhibited in the adjacent figures, has been used by many of the best operators in order to make the deep or final incision, on

FIG. 21.



Sir William Blizard's probe-pointed knife.

the alleged ground of its complete efficiency and superior safety to the sharp-pointed knife. But before exchanging his scalpel for this instrument the operator is very careful that the opening made into the urethra upon the groove of the staff is sufficiently large to admit the probe-point easily, and he secures the opening with his finger-nail during the change. Provided this is accomplished, there is no possible objection to the use of the probe-pointed knife, and if an operator has a conviction that it is safer in his own hands than the sharp-pointed scalpel, he should certainly employ it. With regard to any liability to injure the bladder in the use of the scalpel, *if it exists,* there can be no hesitation as to the propriety of adopting the guarded point. It is said that the opposite wall of a bladder has been perforated by the scalpel in Lateral Lithotomy, but in such a case its point must have left the groove in the staff, and have been freely exposed in the bladder, an act which, under no ordinary circumstances, can form part of the operation.

For the numerous varieties of instrument, designated by the term gorget, which illustrate the second principle of construction referred to, the probe-point also is always employed. Nevertheless, the opponents of the gorget condemn it mainly because it is alleged to slip out of the groove, although it possesses the same guide which is believed to preserve the knife in its place. This discrepancy requires to be explained, and it is not difficult to do so. The slipping of the gorget is not necessarily due to inherent vice in the instrument, but in part to the particular mode of applying it, which has usually, but not invariably, been pursued; viz. to the depressing of the handle of the staff by the operator's left-hand at the precise moment when with his right he thrusts on the gorget to the bladder. Thus the groove in which the beak is destined to run is suddenly raised, and loss of contact is liable to result, especially if the left side of the instrument like the first cutting gorget (of Hawkins) had a convex shoulder. Cline removed this disadvantage, making the left side straight, and placing the beak at the end of it. The practice of this double movement must, I think, be regarded as a principal cause of the slipping of the gorget. Had the staff been held steady throughout, as is the usual mode in modern Lithotomy (Mr. Key's operation excepted), the gorget could have traversed it as safely and as certainly as the probe-pointed knife. The double movement is doubtless to be done safely enough, but it might be hazardous in the hands of any but an adept.

A second and an influential cause of slipping existed in those gorgets, the cutting edge of which forms an obtuse angle with the back of the blade; so that the bladder was pushed before the instrument, instead of being penetrated by it. This objection was also overcome by Cline, who gave it an acute angle. The various gorgets which have formed the leading varieties of this instrument from its first employment as one of the instruments in the "apparatus major," or Marian Operation, to the present day, are shown in the wood-cut on the following page.

The famous charge of John Bell, that "the gorget slips! and all the surgeons of Europe confess it,"* has been repeated perhaps too readily, doing much to discredit an instrument with which we should not forget that some of the most successful practice in this country has been accomplished.† But why it should slip more than the probe-pointed knife, if similarly used, does not appear, and has never been explained satisfactorily.

The essential practical difference between the two instruments is this: that, with the narrow-bladed instrument, or probe-pointed bistoury, the depth of the internal incision depends on the angle it makes with the staff when pushed through the prostate and withdrawn; while with the gorget, the depth of the incision depends mainly on the breadth of the blade; that the wound shall not be too small is thus ensured, and it will not be too large unless the gorget is too wide or is not kept, as it enters the bladder, closely in a line with the staff.

Sir Benj. Brodie used and recommended a probe-pointed knife, of which "the blade is broad enough to divide a con-

---

* Principles of Surgery, 1826, vol. iv. p. 227.

† Mr. Green cut forty cases with the cutting gorget (of Cline) without a single casualty. Cline himself was very successful. It was usually about three-quarters of an inch wide, and one inch for cases of enlarged prostate.

FIG. 29.

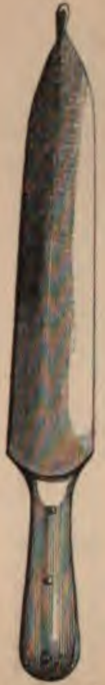


FIG. 28.

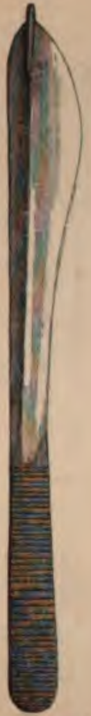


FIG. 27.

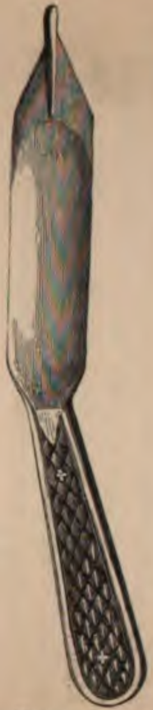


FIG. 26.

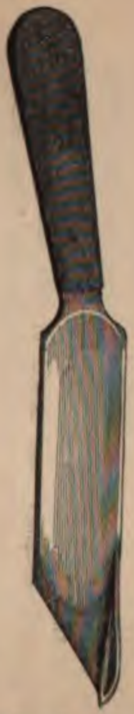


FIG. 25.

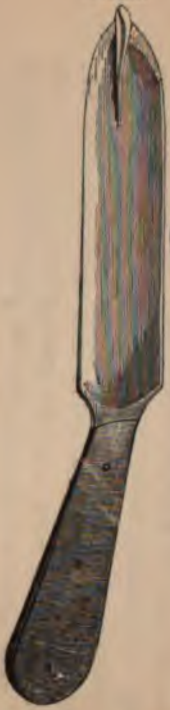


FIG. 24.

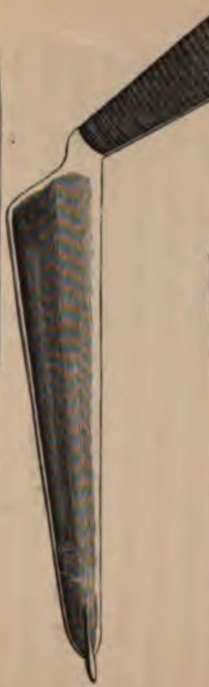


FIG. 23.

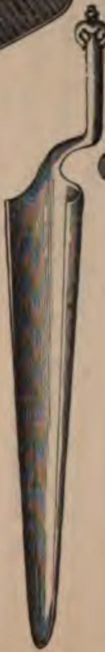


FIG. 22.

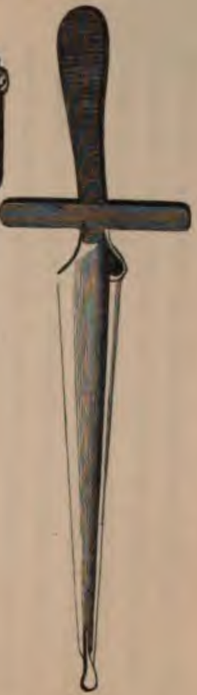


Fig. 22. } Instruments used as dilators of the urethra and neck of the
Fig. 23. } bladder, in the "apparatus major," or Marian Operation.—Heister, Institut. vol. ii. tab. 28.

Fig. 24. The dilator of Cheselden.—Heister, Institut. vol. ii. tab. 31, fig. 9.

Fig. 25. The cutting gorget of Hawkins.—Savigny's Collection of Engravings of Surgical Instruments. Lond. 1798, pl. iv. fig. 1.

Fig. 26. Cline's gorget.—Savigny's work, pl. iv. fig. 3.

Fig. 27. Sir A. Cooper's double-edged gorget.—Idem. pl. vi. fig. 4.

Fig. 28. Scarpa's gorget.—From one sent by Professor Scarpa to Mr. Crichton, of Dundee, now in my possession.

Fig. 29. Dr. Keith's gorget.—From one in my possession.

siderable portion of the prostate as it enters the bladder, without its being necessary to increase the size of the incision by cutting laterally afterwards." This was really neither more nor less than a narrow-cutting gorget (fig. 31).

John Hunter's lithotomy knife was wider still, and was, indeed, a cutting gorget in disguise (fig. 30). So was Langenbeck's (fig. 32), which had a spring catch, converting it, at the operator's will, into a probe pointed knife. The knife which Mr. Smith, of Leeds, used, and with much success, is a wide-bladed, probe-pointed knife. He has four sizes, adapted to the requirements of different cases (fig. 33). Between all these broad knives, and a well-made cutting gorget of moderate width, there is really no essential difference.

Dr. Keith, of Aberdeen, uses a peculiar gorget; for ordinary cases, one which is seven-eighths of an inch wide; and for cases of enlarged prostate, one which is one inch and an eighth wide

FIG. 30.

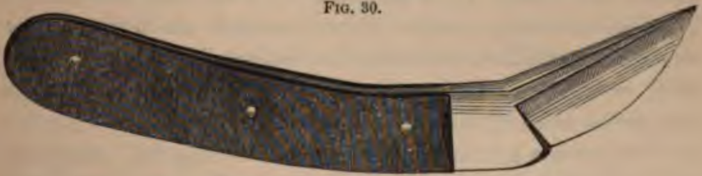


FIG. 31.

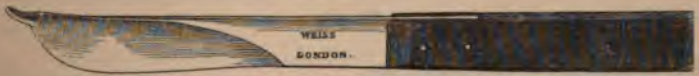


FIG. 32.

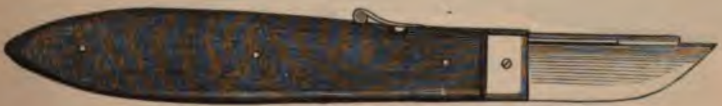


FIG. 33.

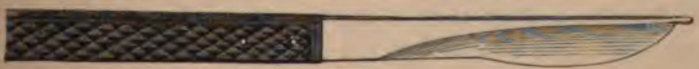


Fig. 30. John Hunter's knife.—Savigny's work, pl. iv. fig. 12.
Fig. 31. Sir B. Brodie's knife.—From one in the possession of Messrs. Weiss and Son.
Fig. 32. Langenbeck's knife.
Fig. 33. Mr. Smith's (of Leeds) knife.—From one sent by Mr. Smith to the author.

(fig. 29). The peculiarity of his instrument is this: that its edge, made at first sharp by the cutler, is afterwards just blunted by himself with a file. It thus divides the substance of the prostate through which it is pushed, but is quite incapable of incising in any way the coats of the bladder. But it is to be recollected that he makes the deep incision with the probe-pointed knife first, and then employs this to extend it and to conduct the forceps. The form of Dr. Keith's gorget is very nearly that of Cheselden's instrument as drawn in Heister's surgery (see fig. 24); but it tapers a little less than that of Cheselden. Mr. Crichton also employed the cutting gorget in a very large proportion of his successful cases. He subsequently employed the probe-pointed knife, continuing to use the gorget still in cases of deep perineum and enlarged prostate. The two gorgets which he employed (which, as well as those of Dr. Keith, are in my possession) are made on the pattern of Cline. It is only fair to state that most of his worst cases were cut with it, the very cases in which his success was so remarkable; and that he confessedly substituted the knife on account of the outcry against the gorget, and not because he disliked the latter.

To this same principle of construction belong the "bistouries cachées," or lithotomes of all kinds (fig. 34); *i. e.* the depth of the incision depends on the breadth of the instrument, and is therefore a result more of mechanical arrangement than of the intelligence and skill of the operator. As in the gorget, its incision is the fruit of well-considered pre-arrangement, not of the surgeon's judgment exercised at the moment. The bistourie cachée, and the cutting gorget, different as they are

FIG. 34.

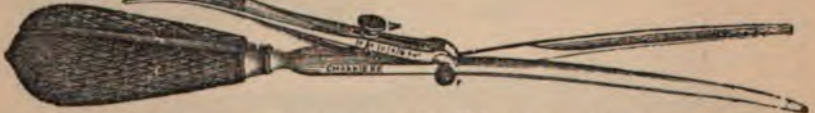


Fig. 34. The lithotome or "bistourie cachée," as used by many foreign surgeons to make the deep incision. A, a screw which regulates the extent to which the blade protrudes from the sheath.

in appearance, and in the manner of their employment, are essentially the same in principle; the gorget cutting the desired depth inwards by pressure, the lithotome cutting it outwards by traction. Only the gorget, owing to its tapered form, cuts rather less deeply at the internal extremity of the incision than at the outer, while the lithotome cuts accurately to the same depth throughout, and consequently incises rather deeply the neck of the bladder, a fact of importance, and rendering the gorget, perhaps, the safer instrument of the two. Blunt gorgets, that is, gorgets which have no pretensions to cut, are rather directors than gorgets in the sense in which we have been considering them. They are intended to dilate an *already-divided* prostate, and to furnish a safe guide to the forceps in certain cases. It was in this light that Cheselden viewed the instrument.

Now, with respect to the choice which may be exercised among these methods of making the last incisions, there is a certain ease and simplicity in the use of a single knife, the sharp-pointed scalpel, which has commended it greatly to modern surgeons, and, unless there are some exceptional circumstances present, it must be admitted to be both a safe and convenient instrument. It was always used by Liston, and has been employed at University College Hospital by Mr. Erichsen and his colleagues since. Sir Wm. Fergusson has also always employed it.

But, on the other hand, there are circumstances in which the probe-pointed knife may be superior. When the stone is large, and the deep incision must therefore correspond to it, the latter is a safer instrument, since its point leaves the staff in that act. When the perineum is deep, as in very stout subjects, and in those suffering from enlarged prostate, so that the finger cannot follow the knife as far as to the neck of the bladder, I prefer the probe-pointed knife for the last incision, as well as the blunt gorget to dilate it, and conduct the forceps into the bladder. I have adopted this method with advantage in a few cases where the prostate has been unusually large.]

There is one more important point to be noticed in relation to the last incision. It is its want of exact parallelism with the external incision. The surgeon is often advised by authors to take care that the plane of the incision at the neck of the bladder should be identical with that of the external wound. Practically, it never is, and rarely can be so; and it is unwise and mischievous to conceal the fact. A glance at the diagram (fig. 35) will show the difference between the direction of the two incisions. Neither is there the evil in this want of parallelism which might at first appear to exist, in respect of the withdrawal of the stone; while the nearer approach to the horizontal line in the last incision, as compared with the first, is, unquestionably, an element of safety. The incision, indeed, was nearly if not quite a horizontal one

Fig. 35.

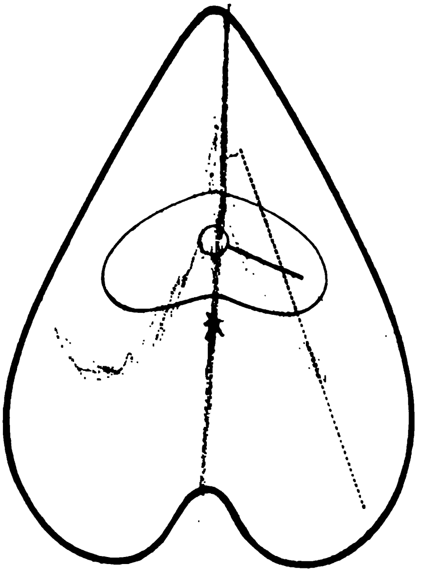


Fig. 35. Superficial and deep incision in Lateral Lithotomy. The former is represented by a dotted line: the latter by a black line.

with most of the best lithotomists of the last generation, whether using the knife or the gorget; sometimes, indeed, with the latter instrument, it inclined upwards. And it is necessary to recollect that if the incision in the prostate be made in the same direction as that of the skin, the limits of the gland would be more easily exceeded. The line of safety through the prostate and neck of the bladder, whether we regard the distance of its enveloping capsule from the staff, or the situation of the seminal ducts, is a slightly oblique line, directed rather nearer to the horizontal than to the perpendicular. And, inasmuch as all such incisions, whether internal or external, produce in the tissues openings more or less oval in form, there is far less want of correspondence in the axis of the entire wound throughout than is generally, or might be theoretically, supposed. The finger passing through a wound so made, if it be cleanly and neatly incised, detects no want of parallelism, but a clear circular passage throughout. It is quite an error to suppose that want of parallelism between an internal and external opening in soft tissues, to which a considerable amount of dilatation is to be applied, materially affects the form or capacity of the route.

III. The forceps being now in the bladder, one blade below on the floor, the other above, the instrument is opened freely and fairly; and as the remainder of the urine flows out, it is probable that the stone will be found between them on closing; if not, they are to be kept closed and slightly moved right and left, to ascertain on which side the stone lies. Supposing it can be felt lying on the outer side of the blades, which still occupy the position first described, the upper blade is raised, by simply depressing the lower handle, and when pretty widely separated, they are slowly turned over to that side and closed, when the stone will almost certainly be felt within the grasp of the instrument. If so, and the withdrawal feels easy, it is made at once, first rotating a little the forceps on its own axis, to make sure that nothing else is included but the stone. If the angle of the handles indicates that the blades are wide apart, the point of the forefinger should be slid along the instrument to ascertain the size and position of the stone, and to readjust the latter if possible. The long axis of the stone should correspond with that of the forceps, and its narrowest diameter should be presented to the blades. If the operator fails to seize the stone, he must still proceed cautiously, and avoid all rapid, plunging, ill-judged, and uncertain movements of the instrument in the cavity of the bladder. And when the stone is fairly seized, the extraction must be slowly and cautiously accomplished; the greatest amount of dilatation of the neck of the bladder and prostate has generally now to be made, and it is more than ever necessary to the patient's welfare, that it be done slowly and judiciously. The forceps must be held so firmly as to secure the stone, but not be grasped so as to crush it. They should be slowly moved from side to side while steady traction is made in the direction of the wound, and consequently in a line obliquely downwards towards the operator's right side. It is quite impossible to over-estimate the importance of slow and cautious action in this stage of the proceeding.

The stone removed, a searcher should be passed into the bladder and a gentle exploration made, to ascertain whether others exist. The calculus itself may be examined for facets on its surface, which are almost always, but not invariably, indications that it was not the only calculus present. On the other hand, the absence of facets is by no means absolute proof that no other stones are in the bladder. If one or more are found, their extraction must be made by the methods already described, taking care not to injure the bladder by haste or violence, which is now the main evil to be feared.

If the stone is found to be unduly large, so that, although grasped in the most favourable position for extraction which its form admits, the divergence of the blades proves to be too great, or is obviously so, for extraction through the wound, one of two courses, at least, remains to be adopted; either to enlarge the wound, or, to crush the stone, *in situ*. These alternatives, however, are rarely presented. Stones weighing nine ounces, and entire, have been successfully removed by the single incision. Crushing *in situ*, with an empty bladder contracting on the calculus, is a dangerous expedient. Nevertheless, when the stone is too large to remove by any wound which it is prudent to make, this course has been of late years usually adopted. It has been successful with a stone weighing upwards of 14 ounces. See discussion of the subject in Chapter VI., on the Difficulties and Dangers met with in Lithotomy.

IV. The Hæmorrhage, which should be watched throughout, is now to be specially regarded before anything else is done. If an arterial jet is seen within reach, a ligature is to be used, or it may be arrested by torsion; if arterial bleeding is taking place freely from a deep part of the wound, its source must be carefully sought, and ligatured if possible. If the ligature cannot be applied in the usual manner, it may, perhaps, be passed beneath by means of a curved needle, and the current stopped by a knot made upon the bleeding point. A safe and efficient mode, when the difficulty is great, is to use a tenaculum of the common form, but connected with its handle by means of a screw, so that the handle can be detached at pleasure: the hook of the instrument is passed under the mouth of the vessel, a noose of thread or silk is thrown round the soft parts beneath and tied; the handle is then unscrewed, and the hook left in its place. I believe I have saved a life on two or three occasions by tying in the tenaculum.*

Of similar service, doubtless, is a contrivance by Dr. Gross, which he calls "the compressing forceps." It consists of blades resembling those of a pair of slender dressing forceps, but with a screw combining the handles, so that any bleeding point when laid hold of can be compressed by turning the screw; the instrument is then left in place.†

When this cannot be accomplished, and the pressure of a finger on the bleeding point itself, or on the pudic artery, commands the hæmorrhage, a trustworthy assistant or two may be employed to keep up such compression for a few hours, at the end of which time, if it has been steadily and unremittingly applied, the object will have been secured. In the absence of such means, and where all other methods have failed, a ligature placed round the pudic artery as it lies under the ischio-pubic ramus has been found successful. It may be accomplished in the following manner:—a stout needle curved towards the point, and carrying a strong silk thread, is introduced through the soft structures which lie on the ramus, close to the bone at its anterior border, and brought out again about three-quarters of an inch deeper in, so as to pass under the pubic trunk, the two ends are tightly tied, and if properly done, the closure of the vessel must be the result. The cessation of the bleeding will show that it has been accomplished. When there is troublesome hæmorrhage in the upper angle of the wound, where it may arise from a wound of the bulb itself, or from the artery thereto, but especially in the former case, the flow may be stopped by external pressure, using a common cork, or a portion of one, as a pad, and maintaining it in place by means of plaister and a bandage. But if the hæmorrhage is venous, the blood being dark in colour, flowing freely, but not in jets, it arises most probably from some of the veins about the apex of the prostate which have been divided. This is sometimes a difficult matter to control. Ordinary plugging of the wound with lint or sponge is very inefficient, and may rather mask the occurrence of bleeding than prevent it, by confining the blood to the cavity of the bladder. A more efficient method is the employment of an addition to the ordinary tube generally introduced after the operation, to convey away the urine. This consists in fastening round the tube, about an inch from the end, a piece of strong but soft muslin, or fine linen, arranged, if I may use such a simile, like a petticoat, reaching to the opposite end. The material is to be plaited in a few folds there, to give room or "fulness," so that after the instrument has been introduced into the bladder, strips of lint may be tightly packed into the cavity around the tube between it and the enveloping material described (fig. 17, p. 22). In this manner the most perfect plugging of the wound in its whole length may be accomplished.

---

* I am indebted to Dr. Keith, of Aberdeen, for the tenaculum with the screw (fig. 18, p. 22), which adds much to its convenience. In the cases referred to in the text, the handle was immovable, and was much in the way; in one instance the instrument remained ten days in the wound, coming away by itself at the end of that time.

† Urinary Organs, by Dr. Gross, 2nd ed. p. 576.

When much general oozing from the surface takes place, without any obvious single source, the application of cold by means of bladders containing ice to the perineum and hypogastrium is extremely useful; they may be applied as auxiliaries in venous bleeding also. Injecting cold water into the wound is sometimes serviceable. Irrigation with iced water is another valuable means of using cold, and is applicable to most cases. It may be accomplished by means of a reservoir of water containing ice, suspended above the bed. Two or three pieces of cotton-wick, or lamp-cotton, one end of each being placed in the water, the opposite ends reaching the patient, will carry a gentle current to the perineum and groins. Provision is made for the issue of the water on some waterproof material, to a vessel to receive it below. The pelvis should be elevated to some extent on a firm cushion, to secure the advantage of favourable position against bleeding, as well as to avoid the heat of the bed, especially if it gives way to the weight of the patient. In all cases it is necessary to husband the resources of the patient as much as possible; hence, no free bleeding of any kind should ever be suffered to remain unchecked. At the same time, the medical treatment of hæmorrhage, which need not be described here, using especially small doses of opium, may in some cases be serviceable.

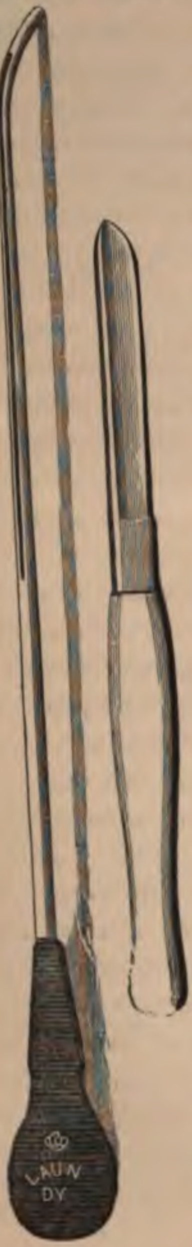
Supposing now that hæmorrhage has not taken place, or that it has been stopped, it is usual to introduce into the bladder a gum elastic tube about six or seven inches long, to prevent the inner portion of the wound becoming stopped by clot or otherwise, and producing retention of urine. The tube is fastened by tapes to a bandage round the patient's middle; but care must be taken that the end of the tube does not project far into the cavity of the bladder and become a source of irritation there. But it is by no means certain that a tube is necessary. Many operators have discarded it altogether, and are satisfied with the result. I have done so in four recent cases, and the wounds appeared to close better and more quickly in consequence.

AFTER TREATMENT.—The patient is next to be put to bed. This should be a firm well-made mattrass, guarded by waterproof cloth. A dry and warm draw-sheet is to be placed beneath his buttocks, so that the wound and all that issues from it is clearly visible. On this account it is desirable that the window of the apartment should face the foot of the bed. Each lower limb is to be semiflexed at the knee, and to repose easily, inclining outwards on a pillow. The attendant will watch sedulously the flow of urine and the oozing of blood during the first twenty-four hours; if the tube appears to be blocked, a feather must be passed through its entire length to ensure freedom of passage. What he desires and expects to see is the outflow of clear unstained urine before the end of that period; which demonstrates the cessation of hæmorrhage and the proper action of the kidneys. Opium may be administered, and in a full dose, if there is much pain, spasm, or restlessness; but it is better to do without it, unless manifestly wanted. I cannot coincide with the conventional practice of giving thirty to forty minims of tinctura opii, or Battley's liquor, simply because a formidable operation has been submitted to, since in many constitutions it deranges the stomach and liver, constipates the bowels, and injures the capacity for taking or digesting nutriment. Cleanliness is of the greatest importance: the draw-sheets must be very frequently changed; the nates are to be kept clean by the occasional application of a soft moist sponge, and all sources of impurity are to be speedily removed. A clean napkin, folded several times, should be placed every hour, beneath the end of the tube, and subsequently to its withdrawal, in the same situation, to absorb the urine. Mild, unstimulating diet, chiefly in the fluid form, such as milk and animal broths, should be freely afforded at first, until the stomach desires solid food, which may then at once be given. There should be no unnecessary haste to give aperients; and three or four days may well elapse after the operation without any anxieties on that head. I have seen mischievous irritation of the pelvic viscera set up by a purgative dose, for which no real occasion existed. Supposing there has been no tendency to bleed, the tube may be withdrawn in twenty-four, thirty-six, or forty-eight hours; if otherwise, it may be retained rather than risk disturbance to the parts for three or four days; but this can rarely be necessary. As the case progresses, care must be taken, especially with elderly patients, to avoid irritation of the skin of the back and buttocks, which, if neglected, might produce bed sores. The surface is to be defended from the contact of urine by the free use of common ointment, and hardened by the occasional use of astringent lotion, or by simple brandy-and-water. A proper position of the patient is by no means unimportant as favouring the desired result; the head, shoulders, and upper part of the trunk, should be kept rather high, so that the wound is placed as much in a depending position as circumstances admit. The patient should lie alternately on his right and left side for a few hours at a time, so as to change the direction of the urine and other discharges.

After the first twenty-four hours, the edges of the wound being a little swollen, urine frequently passes two or three times by the urethra; after twenty-four or thirty-six hours more it passes entirely through the wound. Subsequently, it may be expected, in the cases of adults, to pass in part through the urethra, by about the eighth to the twelfth day; and to cease issuing through the wound in about three weeks after operation. There is much difference, however, in this matter; many weeks elapsing in some instances before the final healing of the perineal wound, which, indeed, in some few instances remains permanently fistulous; while in others healing really occurs by first intention. It would be unjust to the memory of Mr. Crichton to pass over the last-named circumstance without remark. It was a favourite subject with him; nevertheless, it appears to me difficult to regard it as one of great importance. He records thirty examples of it as occurring in his practice, a proportion which is extremely large. Of the cases presented to him, he selected the most healthy and vigorous for whom to attain this result; making his incisions free and clean, so as to offer surfaces adapted to unite readily. No tube was passed through the wound afterwards; a piece of wet lint was applied to it, and the legs fastened together. Occasionally retention of urine occurred, with a good deal of pain, in which case the patient was put into a hot hip bath, which was a favourite remedy with him in all cases of severe abdominal pain arising within twenty-four or thirty-six hours of the operation. But if the stone was large, and had been difficult to extract, or if the patient was feeble, he generally employed the tube, and

LANE LIBRARY. STANFORD UNIVERSITY

Fig. 36. Fig. 37.



Figs. 36, 37. Key's knife and staff, from his work, plate iv.

made no attempt at early union. It is remarkable how different are the opinions of operators as to the value of the tube. While some believe it to be a *sine quâ non* to success, others attach no importance to it. That it can prevent access of urine to the newly-cut surfaces, as has been written concerning it, no one can seriously imagine after reflection, and certainly not after observation, since urine may be constantly found trickling by its side, as well as through it. It is undoubtedly a guarantee against retention, and may be made useful against hæmorrhage, but it is also sometimes a source of irritation to the bladder, and I have seen a patient greatly relieved by its early removal.

For the various accidents accompanying and following the operation, as well as the difficulties and dangers sometimes encountered in its performance, see Chapter VI.

Key's Operation on the Straight Staff.—The operation performed on a straight staff by Mr. Aston Key merits description here, as a modification of the ordinary lateral operation, the consideration of which is now concluded. Mr. Key's operation finds favour with many of his former pupils; and is still preferred by them, as it was by that able surgeon himself to the end of his career. The mode of performing it is given here in his own words, which clearly delineate the method he adopted, and which is followed at the present day by the surgeons of Guy's Hospital.

"The mode of conducting the operation is as follows:—An assistant holding the director," (or straight staff,) "with the handle somewhat inclined towards the operator, the external incision of the usual extent is made with the knife, until the groove is opened, and the point of the knife rests fairly in the director, which can be readily ascertained by the sensation communicated; the point being kept steadily against the groove, the operator with his left hand takes the handle of the director, and lowers it till he brings the handle to the elevation described in Pl. III.," (that is, until the sound makes an angle with the horizon of about thirty degrees,) "keeping his right hand fixed; then, with an easy simultaneous movement of both hands, the groove of the director and the edge of the knife are to be turned obliquely towards the patient's left side; the knife having the proper bearing is now ready for the section of the prostate; at this time the operator should look to the exact line the director takes, in order to carry the knife safely and slowly along the groove; which may now be done without any risk of the point slipping out. The knife may then be either withdrawn along the director, or the parts further dilated according to the circumstances I have adverted to. Having delivered his knife to the assistant, the operator takes the staff in his right hand, and passing the forefinger of his left along the director through the opening in the prostate, withdraws the director, and, exchanging it for the forceps, passes the latter upon his finger into the cavity of the bladder.

"In extracting the calculus, should the aperture in the prostate prove too small, and a great degree of violence be required to make it pass through the opening, it is advisable always to dilate with the knife, rather than expose the patient to the inevitable danger consequent upon laceration." *

---

* Treatise on the Section of the Prostate Gland in Lithotomy. By C. Aston Key. Lond. 1824. Pp. 28-30.

CHAPTER III.

THE OPERATIONS OF LITHOTOMY PERFORMED IN THE CENTRAL PORTION OF THE PERINEUM.

Numerous Attempts made to improve on Lateral Lithotomy.—The Bilateral Operation of Dupuytren.—The Medio-bilateral.—The Median.—Dr. Buchanan's Method.—The Recto-vesical Operation.—Modifications.—Cutting and Crushing combined.—Lithotomy as applied to Children.

THE preceding chapter has been devoted to the Lateral Operation, in order to describe it fully, because many of the minute details of management are common to it and to other forms of Lithotomy, and are therefore given once for all; and because it may fairly be regarded as the standard with which such other modes of operating, next to engage our attention, should be compared.

For the problem has been presented for years, and is still presented to us, although less urgently since the success of Lithotrity for the smaller stones has been completely established:

Is the Lateral Operation the best mode, in all cases, of extracting, through the perineal region, a calculus from the bladder?

That its results have not satisfied the expectations, or, at all events, the wishes of many surgeons, is evinced by the numerous efforts which have been made from time to time, by the most experienced operators, to discover a better method. Witness the Recto-vesical Operation of Hoffman, Sanson, and Vacca—the Bilateral of Dupuytren—the

Medio-bilateral of Civiale; and the Median of the Italian surgeons, with that form of it so well advocated here by Mr. Allarton, to say nothing of the endless lesser modifications which have been many times proposed, forgotten, and reproduced.

One thing strikes a careful observer; it is that all the other operations which have at any time held a position, or are exciting attention in the surgical world, are essentially operations performed in the centre of the perineum, and not on either side, or lateral division of it. All are central in the sense in which it is opposed to *Lateral*.

True, one is called Bilateral, but we shall soon find that it possesses characters which refer it distinctly to the central group.

During the last fifty years especially, there has been a growing conviction that incisions made in the side of the perineum are attended by serious dangers, which may be avoided by incisions limited to the centre.

First, it has been believed that severe hæmorrhage is less likely to follow incisions in the centre than in the lateral division of the perineum, because the great vessels lie in this latter portion, provided further that the median incisions do not much involve the bulb.

Secondly, it has been believed that the capsule of the prostate is less likely to be divided, and consequently that the cellular interspaces between the pelvic viscera are less likely to be opened by incisions in the centre than on one side only of the perineum.

Unquestionably, it must be agreed by all that the anatomical necessities of the region, if alone considered, demand that, in the preliminary incisions of all Perineal Lithotomy, central or lateral, the operator should avoid the upper and outer parts of the perineal space, and that he should confine the deep ones within the limits of the prostate gland. But there is another necessity, not an anatomical but a vital one, less obvious, possibly, to the casual observer, but not a whit less urgent, and with which the former must be reconciled, viz.:—the important fact that the internal opening must be sufficiently free to admit the instrument and the stone to pass without the exercise of so much force as to hazard the destruction of the tissues at or about the neck of the bladder. It is the clashing of these two opposed considerations, the vital and the anatomical, which will, probably, always maintain a difference of opinion and of practice in Lithotomy. One school will be most influenced by the dangers to which Anatomy demands attention. Another school will be most impressed with the injury which the tissues suffer when incisions have been unnecessarily limited. The difficulty is to reconcile them; to find precisely the safe medium of action. It must vary in different cases; and the knowledge and the judgment of the operator must decide the question in each.

It was under the influence of anatomical considerations that Dupuytren was led to devise his Bilateral Operation. To avoid the arterial branches springing from the great trunk of the pudic on the lateral boundary; to avoid the bulb above and the rectum below; to avoid by two minor incisions springing from the central axis any division of the prostatic capsule by the single large incision directed to one side, he planned the following procedure, and first performed it in 1824.

DUPUYTREN'S BILATERAL OPERATION.—Having introduced a staff with a median groove, he made a crescentic incision above the anus with the horns of the crescent downwards. Each extremity reached midway between the anus and the adjacent tuber ischii, and the middle or highest point was distant from the anus about ten or twelve lines. By this incision were divided the skin, the superficial fascia, and a little of the external sphincter. In the next, the membranous urethra was opened transversely, and sufficiently to admit the operator to introduce the end of a two-bladed lithotome into the groove of the staff. This was pushed onwards into the bladder, the stone felt with it, and the staff removed; the blades being then opened to an extent previously provided for, they were steadily withdrawn in the middle line and in the horizontal plane. By this means an incision nearly transverse, but also somewhat obliquely downwards, was made of the neck of the bladder, and into each lateral lobe of the prostate. In a few years afterwards some slight modifications of this proceeding were made by various operators, but they possess only historical interest, and have no practical value. See fig. 39 for a diagram of the incision superficial and deep. Fig. 38 shows the two-bladed lithotome which he employed.

FIG. 38.

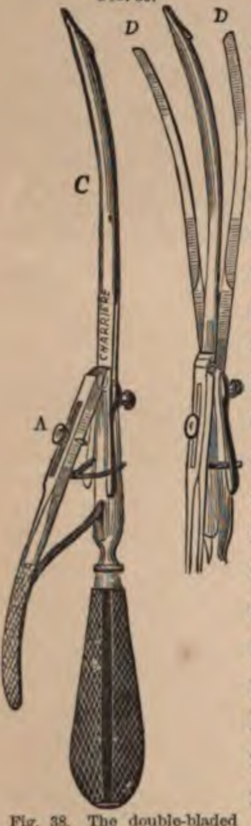


Fig. 38. The double-bladed lithotome, for the bilateral and medio-bilateral operations. A, the screw which regulates the extent to which the blades open. C, the sheath with the blades enclosed. D D, the blades opened.

THE MEDIO-BILATERAL.—We next

FIG. 39.

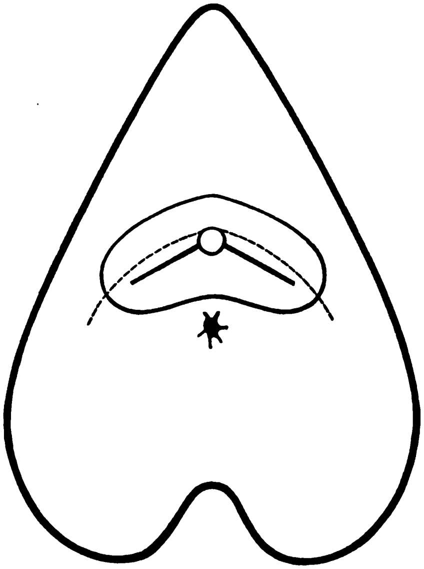


Fig. 39. Diagram of superficial and deep incisions in Bilateral Lithotomy. The former is represented by a dotted line, the latter by a black line.

come to a method which Civiale describes in his "Parallèle,"[*] published in 1836. "Being dissatisfied," he says, "with the results of the bilateral operation, and shunning the lateral method on account of the anatomical objections referred to," he first practised a medio-bilateral method in 1829, and has performed it ever since. It is remarkable that this operation, although now upwards of thirty years old (1863), appears to be little known in this country. I believe it has never been even described here, which is still more remarkable, considering its near relationship to the median operation, and the fact that this has been so much discussed here of late years. I have myself witnessed the successful performance of it in its author's hands, and have been, I believe, the first to perform it in this country, in a case which occurred during the autumn of 1861, and have repeated it several times since (1870).

---

[*] Parallèle des Divers Moyens, &c. Paris, 1836. Pp. 192 and 217.

Civiale's method of doing it is as follows:—Having introduced a staff with a median groove, which is firmly held resting against the pubes by an assistant, he makes an incision about an inch and a half long in the raphé of the perineum, immediately in front of the anus, and carefully cuts down in the direction of the staff, endeavouring to avoid the bulb, until he reaches the membranous portion of the urethra. He then carries his knife into the staff in that situation by an incision sufficiently large to enable him to insert with ease the end of a double-bladed lithotome, resembling that of Dupuytren, but straight instead of curved, into the groove of the staff. He then slides the beak of the lithotome steadily onwards into the bladder, and having done so, draws it outwards in the groove, towards himself, dividing the neck and the prostate horizontally, as well as the deep fascia in its course. The external wound is oval in form, a vertical incision in the perineum always becoming so; hence the skin is not cut transversely by the lithotome in the act of withdrawal. The finger is now introduced, and the forceps upon or guided by it, in the usual way; the external and internal openings are felt to correspond, and to form an easy and direct route for the removal of the stone. I have seen Civiale remove a stone weighing one and a half ounce by this method, the patient, a man forty-five years of age, making a good recovery. The breadth of the internal or horizontal incision is less than in Dupuytren's operation, in which the two blades of his lithotome were extended so as to be one and a quarter to one and a half inch apart. Civiale advises that they should ordinarily be one inch apart, and never or very rarely more than an inch and a quarter (fig. 40).

FIG. 40.

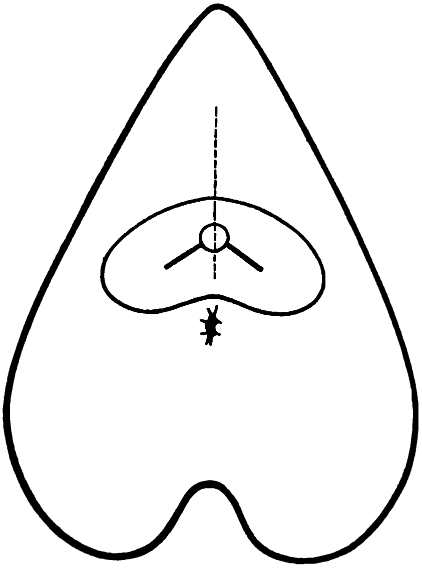


Fig. 40. Incisions superficial and deep in the Medio-bilateral Operation.

MEDIAN OPERATION.—The Italian or median method, known here as Allarton's operation, is the next in order to be described. The operator having placed a staff with a median groove in the bladder, and entrusted it to an assistant to maintain strictly in the middle line, and resting closely on the pubic symphysis, places his left forefinger in the rectum, with its palmar surface upwards, to determine the apex of the prostate, placing the point of his finger upon it. Next, he transfixes with a long and straight bistoury, the cutting edge of which is directed upwards, the integuments of the perineum, in the median line, commencing about half an inch anterior to the anus, and carries it steadily onwards until it enters the groove in the staff, and pierces the urethra about the membranous portion, the finger in the bowel rendering this manœuvre tolerably easy. Having pushed the point of the knife, which should cut for a small space at the back, onwards towards the bladder for the extent of a few lines, so as just to incise the apex of the prostate, he cuts upwards, dividing the urethra a little, and making an external incision from an inch and a quarter to an inch and a half long, according to the presumed necessities of the case. He then introduces a long ball-pointed probe through the wound into the bladder to serve as a guide for the left index finger, which immediately follows directly into the bladder, and the staff is at the same time withdrawn. The stone may now be felt, and the wound

FIG. 41.

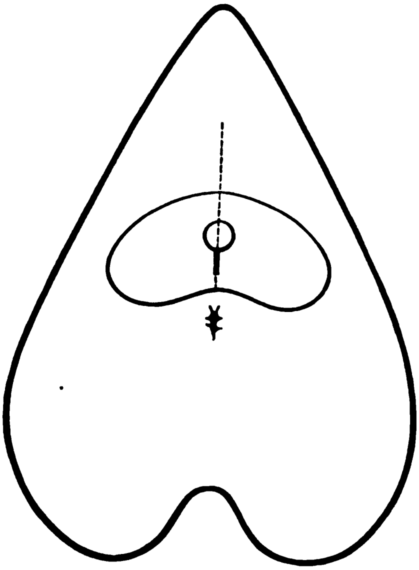


Fig. 41. Incisions in the Median Operation

dilated by means of the finger. Mr. Allarton has recommended, if the finger be insufficient for the purpose, the use of Dr. Arnott's hydraulic dilator; and Mr. Teale, of Leeds, has designed and employed a branched metallic dilator. I cannot, however, concur in advising the employment of mechanical force in dilating the structures forming the neck of the bladder, believing it far safer to make an additional section when necessary. Respecting the modes of making the incisions, I prefer dissecting from the skin inwards to the staff as in other operations, to the method by transfixion above described, and have done so in most of my operations by the median method: maintaining the left forefinger in the rectum during the final strokes of the knife to feel its position, and insure the safety of the bowel.

The incisions here described differ little from those of the Marian, except in being carried further back than in the ancient method, and hence leaving a shorter portion of the urethra, the prostatic only, to be dilated. As before noticed, the danger of the Marian arose from the practice of forcibly rending asunder the urethra and neck of the bladder, a proceeding infinitely more fatal than division by the knife, which the anatomical theory, so greatly in the ascendant at that time, had, unhappily, proscribed.

Of all the cutting operations for stone, it is unquestionable that the median still presents that in which the bladder is reached with the smallest amount of section by the knife. And it appears to become dangerous, just in proportion as injury by laceration or over-pressure, under the name of dilatation, is superadded to the incisions. These latter involve the bulb to a small degree, which is the only structure of importance divided by the knife besides the prostate, and this latter is only slightly notched at the apex in the ordinary mode of performing the operation. But when the deeper parts of the wound feel more than usually rigid and unyielding, or when the stone proves to be larger than was anticipated, it is advisable to make an incision in the left side in the same direction as in Lateral Lithotomy, but generally less extended, for the purpose of affording more space. This is accomplished after the urethra has been opened, by introducing a long straight, probe-pointed bistoury, guided by the left index finger, and made to incise as much as the operator deems necessary. Unless this or some similar proceeding be adopted the opening is certainly small, and feels tight to the finger, and, if the stone is large, appears to me to require an additional incision.

After all, the anatomical axiom laid down at first must not be forgotten, viz. that any operation, the incisions of which lie altogether in the line above the anus and below the symphysis pubes, unless aided by a lateral section, never can afford an opening sufficiently capacious for the removal of large stones without dangerous laceration. Examine the pelvic outlet, and contrast the want of space in this situation caused by the converging pubic rami, with the room which exists in one of its lateral divisions, and the correctness of this assertion will, I think, be manifest.

BUCHANAN'S OPERATION.—The Operation of Dr. Buchanan with the Angular Staff. This proceeding, generally known as the operation with the angular staff, is, however, not rendered distinctive solely by the use of that instrument. The angular staff does not constitute the main element which characterizes it from other proceedings, although it is one of its features, and perhaps, at first sight, its most obvious one. Thus it is that this character has taken hold of the public mind, and, by its prominence, has somewhat concealed the more important attributes of the operation. It is essentially a central operation, but with a freer internal opening than is provided in the median. The angular staff is intended to be a safe and efficient guide to the deep part to be incised, viz., the membranous urethra and apex of the prostate. Such a staff has been used a century or more ago in the lateral operation, a fact which detracts nothing from any merit which may attach to the present procedure.

Actuated by his conviction of the anatomical dangers of Lateral Lithotomy, Dr. Buchanan, of Glasgow, called attention, in 1847, to the advantages of operating in the central part of the perineum instead of the lateral, and of employing a staff of rectangular form, on which to make the necessary incisions. It is somewhat remarkable that his method has never been yet correctly described in our language, and I am indebted to Dr. Buchanan for a description in French, which he informs me is the most accurate now existing. I must confess that until I became acquainted with the latter I had not a correct idea of the proceeding. It may be briefly described as follows:—

Instead of possessing any curve, the terminal portion of the staff, three inches in length, is directed at a right angle to the shaft, and contains a deep lateral groove. This is introduced into the urethra, and by means of the left forefinger in the rectum the angle is made to correspond in situation with the apex of the prostate, so that the gland can be felt just beyond, between the finger and the staff; the latter being well depressed, the angle is brought near to the surface and is readily felt in the perineum. The staff is then carefully maintained in this position by an assistant. The operator keeping his finger still in the rectum, enters a long straight bistoury opposite the angle of the staff, and therefore immediately in front of the anus: he holds it in his right hand, with the palm upwards; the blade horizontal and its edge directed to the left; and he pushes it straight into and along the groove as far as to the stop at its extremity. He thus enters the bladder at once, taking care to keep the blade parallel with the horizontal or grooved portion of the staff throughout the whole of the thrust. Next he withdraws the bistoury slowly, but, as he does so, cuts outwards and downwards a distance rather more than equal to another breadth of his blade, and then directly downwards to the same extent,

FIG. 42.

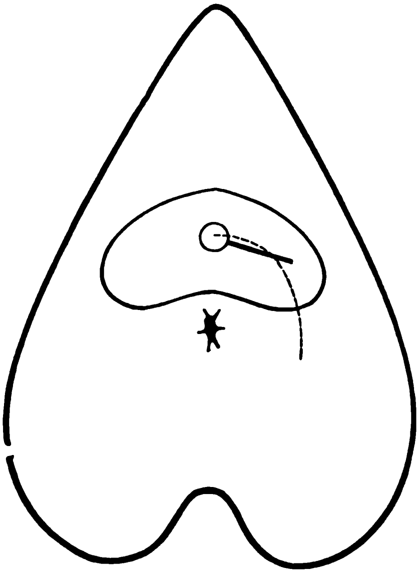


Fig. 42. Incisions superficial and deep in Dr. Buchanan's Operation.

describing, in this manner, a curved line equal to about one-fourth of a circle round the upper and left side of the rectum (patient's left), in which his finger still remains. An external wound, surrounding the corresponding part of the anus, about one inch and a quarter in length, results from the operation. The knife is a long straight bistoury, about a quarter of an inch wide, with three inches of cutting edge, and the point sharp at the back as well as at the front, so as to penetrate with facility.

This is essentially a median operation, all large arterial branches in the lateral part being avoided, while the bulb is not cut, but the left half of the prostate is incised to a small extent.

Thus far it is, as expressed by Dr. Buchanan himself, about equal to the half of Dupuytren's Operation. If the stone is large, an incision is made on the right side of the prostate, which has the effect of converting the proceeding very nearly into the operation referred to. But it is also capable of being extended in another way, since if the incision by the side of the rectum and through the prostate be continued much beyond the extent described by its author, in the original direction, it becomes a lateral operation placed very low in the pelvic outlet.*

---

* Dr. Corbet, of Glasgow, has added an external grooved director connected with the handle of this staff; after the introduction of the latter into the bladder, the point of the director has only to be pressed through the tissues into the angle of the staff, which it infallibly meets, and a route for the knife is made from the skin of the perineum to the bladder. (*Medical Times*, Dec. 16, 1858.) Sir James Earle adopted the same system for Lateral Lithotomy. See a descriptive plate in his "Practical Observations," 2nd edition, London, 1803. Mr. Avery contrived a very ingenious apparatus by which a director was *forced outwards* by mechanism from the angle of the staff after the latter had been securely placed in the bladder; when the point of the issuing director had made its appearance through the skin, the operator commenced to travel along its route into the bladder. It may not be inappropriate to mention that Mr. John Wood, of King's College Hospital, has designed and employed a staff, the lower part

THE RECTO-VESICAL OPERATION.—The patient is placed in the usual position, and a large staff with a median groove held firmly in the middle line. Taking a strong, straight, sharp-pointed bistoury in his right hand, the operator introduces it flat on the palmar surface of his left forefinger into the rectum, and feels with its tip the line of the staff. When about an inch and a half or an inch and three-quarters of the blade are concealed within the bowel, with the right hand he raises its edge, and carries the knife upwards to the groove in the staff, propelling the blade at the same time with the left forefinger. He thus divides, at this first incision, the upper wall of the rectum, the sphincter ani, and the integuments and subjacent tissues for about an inch in the middle line of the perineum. He should reach the groove of the staff in this first incision, and having done so, he next directs the nail of the left forefinger, so as to enter the groove near to the membranous urethra, and guide the point of the bistoury into it there, the edge being now downwards. Having securely placed it in the groove, he pushes the blade from him along the staff, directed by the left forefinger, dividing the prostate and neck of the bladder so as to reach the trigone. The exact extent of this incision must depend on the size

---

of which consists of two blades, which, at the will of the operator, may be made to expand a little in order to stretch the urethra and afford a wider groove for the knife.

I hope I am not presumptuous in venturing to regard—I believe in common with many practised lithotomists—all these contrivances as entitled to rank rather among the curiosities of surgical appliance than as valuable aids to the operator. Elaborate mechanism cannot countervail the want of surgical tact. Where the latter exists, such aid is worse than useless. "Tactus eruditum," the priceless and incommunicable heritage of experience, can only be acquired by the use of simple instruments; by discarding complicated apparatus for all those purposes which can be attained by that most wonderful and intelligent instrument, the human hand.

of the stone, and, as it may be presumed that this method should be employed only when the stone is unusually large, the incisions must of course be free. In no case, however, is it permissible to place in danger the peritoneal pouch, which limits the posterior border of the trigone. The finger can now easily examine the stone and guide the forceps in the extraction. The wound is favourably placed as an outlet for all discharges, and no hæmorrhage need be feared.

There are some variations in the manner of performing this operation, but the foregoing is the mode which has generally been regarded as the most successful, and the most likely to be free from disagreeable after consequences.

Such are the methods of performing Perineal Lithotomy, which, after a careful consideration of the numerous proposals and modifications which have been made and practised, I have concluded to be the typical forms which are or have been employed in modern times. Numerous others might have been mentioned with which the names of several surgeons are connected, and who possibly may regard my selection as incomplete. Thus it may be considered by some that I should have included among them the Prerectal method, formerly introduced in Paris; but it is difficult to admit that it possesses claims to be regarded as a new type, or, indeed, that it manifests much improvement on any old one. This, however, is a matter of opinion. The operation so named is a modification of the Bilateral, in which the curved incision and subsequent dissection are carried so close to the anus and rectum, that the first stage consists in a delicate dissection downwards of the upper surface of the rectum; a method adopted with the design of leaving the bulb untouched. The urethra is opened at the apex of the prostate, which is then incised with the two-bladed lithotome in the ordinary manner.*

Attempts have also been made to combine cutting and crushing, so as to empty the bladder at one operation. The object has been, first, to open the urethra in the perineum, anterior to the prostate; a proceeding which we know involves very little, if any, risk; and then to introduce a crushing instrument, break up thoroughly the stone, and remove the débris at once. Theoretically this method has a better aspect than in practice. The difficulty in executing it is due in a great measure to the escape of urine by the side of the crushing instrument, so that before the work of breaking the calculus is completed the bladder is empty; when the situation is no longer merely one of difficulty to the operator, but of danger to the patient. Much the same thing may happen in Lithotomy when the stone is crushed by inadvertence in the blades of the forceps; a good deal of instrumental manipulation is requisite in order to ensure the removal of every fragment, while the bladder is in some risk of being injured, or of becoming inflamed. As in the case of applying screw forceps to a stone too large to extract after the incisions have been made in the lateral operation, the risk of danger consists in the liability of the empty bladder to sustain severe injury.†

LITHOTOMY AS APPLIED TO CHILDREN.—In considering the various methods hitherto described, the common practice has been followed of assuming an adult to be the subject of the operation in each instance. And there is little occasion to modify them for the cases of children, the same procedures being applicable, for the most part, at all ages. Nevertheless, there are certain points of importance to be attended to in the application of Lithotomy to children, which will be briefly mentioned here.

---

* The Prerectal method is described by its author, Nélaton, in his "Élémens de Pathologie Chirurgicale," Tome Vième, p. 229. Paris, 1859.

† See also the subject considered in Chapter VI., under the head of Difficulties arising from the Extreme Size of the Calculus, with drawings of instruments for crushing it in the bladder, in lithotomy.

First, as to the kind of operation most generally applicable to the cases of infants and boys; the lateral is generally, and no doubt correctly, held to maintain its superiority, as a rule, over other methods. The median and the medio-bilateral are both admissible. But especially where the stone is large, the lateral operation affords the opportunity of making a freer opening, and in a direction in which the incision is less liable than that of the median to injure the seminal ducts. At the same time, a lateral section carried beyond the limits of the prostate, which is an extremely small organ at this period of life, is almost free from danger, since it is beyond all question necessarily practised in almost all infantile cases, while the death-rate among them is not more than half what it is in adult age, at which time such sections, it is commonly believed, are extremely dangerous.

In the performance of Lateral Lithotomy in children, the employment of one knife only is especially indicated. An exchange of the scalpel for the beaked knife exposes to some risk from the possibility of finding difficulty in the attempt to place the beak of a second knife in the opening made by the first, and thus of missing the groove of the staff altogether. The deep incision in the urethra and prostate should be made with clearness and decision, and with sufficient freedom to admit the tip of the operator's index finger with tolerable ease, otherwise he may drive the neck of the bladder along the staff, or slide the finger into the cellular interval between the bladder and the rectum. The staff should be strongly curved, and the finger and the forceps should be kept well up behind the symphysis in their transit, in consequence of the high situation of the bladder, which, in very young children, lies, when distended, as much in the abdomen as in the pelvis.

Hæmorrhage should be carefully guarded against, as its results in the shape of exhaustion are particularly dangerous in young subjects. The special sources of difficulty and danger in this operation will be considered in the sixth chapter, on the Difficulties and Dangers met with in Lithotomy.

If the median operation is performed, it is desirable to use a guide into the bladder in the shape of a blunt gorget or some similar instrument, as the operator may find it extremely difficult to introduce the finger into the small urethra of a child, when opened anterior to the prostatic or membranous portions. For this purpose I used with advantage, three or four years ago, an instrument of that kind, tapering in its contour, and having a probe point in its central axis. Mr. Bowman, and Mr. Teale also, about the same time, employed somewhat similar means for meeting the difficulty referred to, which each had encountered. By the use of any of these instruments the incised opening into the urethra is partly dilated and partly torn, a proceeding which appears to be attended by no evil results in children, whatever may be its effects in the adult patient. In the medio-bilateral operation, which I have employed in the young subject, no such guide, of course, is necessary. The two-bladed lithotome glides easily along the staff into the bladder, and forms sufficient room for the finger in its withdrawal by laterally incising the soft parts.

CHAPTER IV.

THE SUPRAPUBIC OR HIGH OPERATION.

Origin of the Operation.—Method of Performing in Detail.—Mortality of the Various Operations described.

We now arrive at a consideration of the operations performed above the pubes, of which one is the type, known as The High or Suprapubic Operation. This appears to have been designed by Pierre Franco, and was certainly first performed by him in the year 1561. It was introduced into this country by Proby, at the close of the sixteenth century, and was frequently practised afterwards in the early part of the seventeenth century by Douglas, Cheselden, and others. Subsequently, it was studied with care and frequently performed by the Souberbielles in France, while Mr. Carpue, who had witnessed their practice, advocated it in this country. There are two or three modes of performing the operation, but that which appears to me the most complete, and which Civiale informs me he has practised several times, is as follows :—

The patient is placed on a firm operating table of the usual height. He lies on his back, with the pelvis elevated at least four or five inches above the level of the loins and shoulders, so that the abdominal viscera shall not press on the bladder, but rather fall away backwards from it. The bladder, which should be capable of retaining a tolerably large quantity of fluid, is now to be injected to a full extent, so as to bring its apex to the upper border of the symphysis pubis, or above it. In this manner a sufficient space is obtained between the symphysis and the peritoneal investment of the anterior wall of the abdomen, where it quits it to cover the bladder. The limits of this interval admit of great extension, being filled mainly with cellular and fatty tissues of a very loose and extensible character, and this fact it is which furnishes the ground for operating in this situation. It follows, therefore, that if the bladder is not capable of considerable distension so as to rise into the interval in question, the case cannot be regarded as suitable. The surgeon now passes into the bladder the "Sonde à dard" (fig. 43), (an instrument having very much the form, size, and appearance of a large prostatic catheter), and by depressing its handle raises the point nearly to the level of the upper border of the symphysis. It contains within it a strong stylet with a cutting point, which latter is concealed close to the apex of the sound, and lies in its concavity, whence it can be made to emerge at the will of the operator. Having confided the "sonde à dard" to an assistant, he places himself on the patient's right side,

FIG. 43.

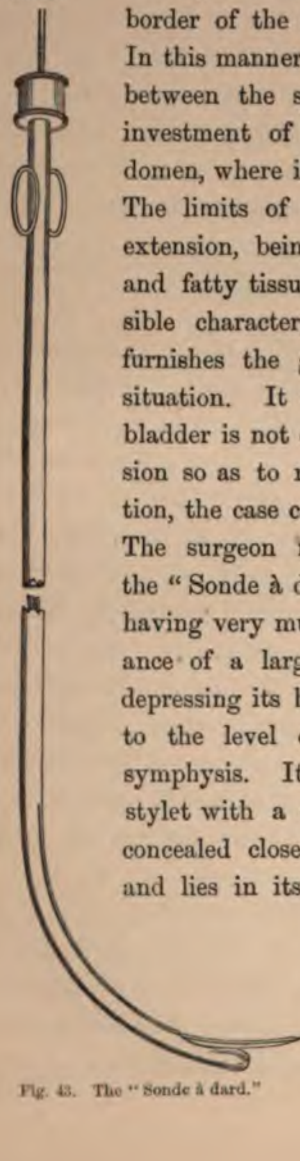


Fig. 43. The "Sonde à dard."

and commences the incision above the pubes, which should be from three to four inches or more in length, according to the amount of fat at this spot, and which in some subjects is very abundant. It is to be made exactly in the median line, and at its lowest point should reach the top of the pubic symphysis. The cellular tissue and fat are divided to an equal extent, until the linea alba is exposed by its characteristic glistening appearance. Placing his left index finger on this, and verifying through it the upper border of the symphysis, he divides with the scalpel the linea alba at this point, in the median line, from a quarter to three-eighths of an inch, and then introduces the bulbous extremity of the aponeurotome (fig. 44), which by its form enables the tendinous structures to be incised without any risk to the parts beneath. The division is accomplished by directing the aponeurotome upwards to the extent of one and three-quarters to two inches. The operator now takes the "sonde à dard" from the hands of the assistant, who has hitherto held it in its place; and with the right hand depresses its handle between the thighs of the patient, directing the point to the wound above the pubes. With his left hand he seeks the end, now readily to be felt through the tissues still remaining uncut, and fixes it between the thumb, index, and middle finger, taking care while doing so to remember that it is from the concave surface that the point will be

FIG. 44.

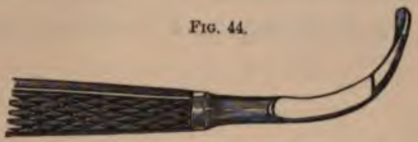


Fig. 44. The Aponeurotome.

protruded. Having rendered the instrument quite firm between his two hands, he directs the assistant to press the handle of the stylet so that the point issues from its place for two or three inches, and appears in the wound immediately above the symphysis. A communication with the bladder is thus perfectly established. The surgeon now takes an ordinary scalpel, and placing it in a groove existing for that purpose in the stylet, cuts downwards from the point of transfixion nearly to the neck of the bladder behind the symphysis. His forefinger is then applied, with its palmar surface upwards, to the top of the wound, to hook up the bladder, while the assistant withdraws the "sonde à dard," having first replaced the stylet in its sheath. An instrument called the "Gorgeret suspenseur" (fig. 45), but which we may term the hooked gorget, now replaces the finger, and is committed to an assistant standing on the left side of the patient. It is very important to maintain the top of the bladder steadily in place throughout all subsequent movements, and that the peritoneum, which is quite close to the wound at this point, should be preserved from injury. The surgeon now searches the interior of the bladder with his fingers, ascertaining the position

FIG. 45.

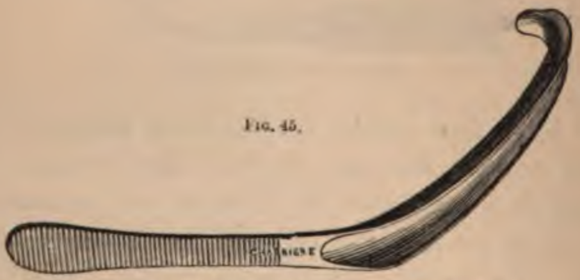


Fig. 45. The hooked Gorget, "Gorgeret suspenseur."

and size of the stone, and introduces the forceps for its removal, which is generally tolerably easy, and may be effected by careful traction upwards and backwards. In a few cases with stones of extreme size the wound has been divided laterally to a small extent in order to afford additional space.

CHAPTER V.

CAUSES OF DEATH FOLLOWING LITHOTOMY.

Causes of Death at different ages must be considered separately.—Causes of Death in Adults.—Inflammation of Tissues around the Neck of the Bladder; and its Causes: most commonly due to Violence in withdrawing the Stone.—Urinary Infiltration; sometimes leading to Peritonitis; from Erysipelas, &c.—Cystitis; sometimes leading to Inflammation of the Kidneys, or of the Peritoneum.—Absorption of Poisonous Products from the Urine.—Phlebitis and Pyæmia.—Shock.—Hæmorrhage and Exhaustion.—Tetanus.—Causes of Death in Children; why differing from the preceding.—Peritonitis: very rarely, Infiltration.—Exhaustion, &c.

WE now arrive at the important subject of the causes of death following the operation of Lithotomy. And this will be studied with advantage before coming to an appreciation of the different modes of performing it already described. A careful consideration of numerous facts leads me to take views of this question which differ somewhat from those generally held respecting it.

In the first place, it is impossible to regard the deaths following Lithotomy as a single aggregate or class, relative to which any leading particulars can universally apply. Nothing can be more deceptive than a method of dealing with the results of Lithotomy, whether numerically or otherwise, by which cases of all ages are treated indiscriminately in one category. The causes of death are not the same in adult life and in the period of youth; indeed, they vary so much as to render a separate consideration of them necessary. Nevertheless, it has been the custom to regard the fatal contingencies of all ages in the mass, without making this distinction. The differing liability to death at the two terms of life has, on the other hand, been amply demonstrated.

I shall consider, then, first, the causes of death after Lithotomy among adult patients. And these causes will be examined, as far as possible, in the order of their importance, that is to say, according to the frequency of their occurrence. Afterwards the causes in children shall be investigated separately.

I. The first, and, beyond all doubt, the most frequent cause, is inflammation of the tissues, especially of the loose cellular tissue around the neck, base, and sides of the bladder; always of a destructive character, and generally with a tendency to extend to the neighbouring peritoneum.

This inflammatory action may be caused by mechanical violence, by want of reparative power in the patient, from erysipelas; and some have supposed by urinary infiltration through too deep incisions.

1. By mechanical violence inflicted in the removal of the stone, especially when the opening is of insufficient size.

The great majority of authors affirm that infiltration of urine is the most common cause of death, a statement that I venture not only to call in question, but to regard as the source of serious error in practice. Infiltration of urine may be one of the causes of suppuration, and destructive inflammation of the perivesical cellular tissue, but it must be a rare one. The doctrine based on this belief is as follows:—If the internal incision passes beyond the limit of the prostate in any direction, so as to open up the cellular interspaces behind the deep fascia, urine is almost certain to find its way into them, and if it does so, fatal inflammation will result: in order, therefore, to avoid this danger, the internal incisions must be extremely limited. But, sound as the principle is to keep the internal incision strictly within the prostate in adult patients, in practice I am satisfied that the desire to limit it has been carried to an extreme degree, and that another and not less serious danger of arousing inflammation of the same cellular tissue has by this very means been increased; I mean the danger which attends an attempt to drag the calculus through an opening of insufficient size. From what I have seen of the practice of Lithotomy in various hands both in town, in the country, and abroad, I am persuaded that insufficient internal incisions are equally dangerous with those which are too free, and that the tendency of the present day is towards the former extreme. The purely anatomical view of the subject appears just now to be in the ascendant. The vital attributes and dispositions of the organs involved are not sufficiently regarded. The student is taught to fear beyond all things an approach of his knife to the peripheral limit of the prostate, and, in over-dread of cutting it, he barely divides the prostate at all. Hence, the no less dangerous injury which results from violence inflicted by the forceps and by the stone upon the neck of the bladder, and from the powerful traction upon it, which injures, often irreparably, the loose cellular connections in which the viscus is embedded; connections which are delicate in structure, and loosely applied, for the purpose of permitting free extension of its parietes to the varying condition of size, which its function as a reservoir of urine demands. Inflammation of these delicate structures is easily produced by that process of forcibly dilating the neck of the bladder which insufficient incisions render necessary, through the pressure, sometimes producing sloughing, to which they are thus subjected; it is also no less certainly caused by traction downwards of the viscus, which inflicts injury upon them in the manner just indicated. And, when inflammation has once extended through these structures, it may soon invade the peritoneum, which, very probably, is more frequently implicated in this manner than by any other means. In connection with this subject there is a very significant fact, the bearing of which will be presently examined, viz. that while it is certain that the boundaries of the prostate are almost invariably overstepped by the knife in children, infiltration of urine does not occur in their cases. That the prostate has often been completely divided in the adult with impunity, for the removal of large stones is certain, and the risk incurred from that cause is unquestionably serious. Danger is always great in a ratio proportioned to the size of the calculus, but this arises quite as much from the violence inflicted in removing it as from the depth of the incisions employed.

Let it not be imagined from these remarks that any one can deprecate more strongly than myself the making of an incision in the prostate more deeply than the size of the stone demands, but I am very certain that it is safer to extend the incision when the stone cannot be extracted without exerting violence, than to inflict the injury which such a proceeding necessarily involves. The advocacy of small internal incisions by Scarpa, who laid down as an axiom that an incision of five lines into the prostate with dilatation sufficed for the extraction of a stone of more than ordinary size;* and by Sir Benj. Brodie, in his admirable lectures here, as the sole or chief means of preventing urinary infiltration, has greatly influenced professional opinion on this subject. And I believe the effect may have gone even beyond the intention of its authors, since the force with which this particular source of danger has been insisted on by almost all subsequent writers, has led many to regard it as the only, or at least the main, evil to be feared in the operation, and thus, perhaps, has indirectly occasioned the oversight of danger in the opposite direction. I wish here to point out, that in shunning Scylla, we may encounter Charybdis; that an obstacle to successful Lithotomy lies on either side of our path, and not on one side only; that we must preserve the neck of the bladder equally from too deep an incision on the one hand, and from the mechanical injury necessitated by one which is too limited on the other. I fortify my position by reference to the significant fact that the most successful operators have been those who advocated sufficient incision as less dangerous than violent extraction. Thus Mr. Martineau, who is well known to have cut eighty-four cases (but including many children) at Norwich, with only two deaths, writes, in that brief and simple account of his method which he presented to the Medical and Chirurgical Society in 1821: "Should the stone be large, or there be any difficulty in the extraction, rather than use much force, while the forceps have a firm hold of the stone, I give the handles to an assistant, ... while the part forming the stricture is cut, which is easily done, as the broad part of the blade becomes a director to the knife; and rather than lacerate, I have often repeated this enlargement of the inner wound two or three times."* Cheselden himself had recorded a similar opinion. Describing his method of extracting the stone, he says :—"I first feel for the stone with the end of them" (the forceps), "which having felt, I open the forceps, and slide one blade underneath it, and the other at the top; and if I apprehend the stone is not in the right place in the forceps, I shift it before I offer to extract, and then extract it very deliberately, that it may not slip suddenly out of the forceps, and that the parts of the wound may have time to stretch . . . . and if I find the stone very large, I again cut upon it, as it is held in the forceps."† But, on the other hand, it is never to be forgotten—and Cheselden refers to it in the foregoing passage—that the neck of the bladder is susceptible of dilatation to a very considerable extent, if only it be gradually exerted. It yields first, to the pressure of the finger as it passes through immediately after the knife; secondly, it dilates further in the act of sliding in the forceps upon the finger; and lastly, it gives way still more when the forceps is withdrawn, containing a stone between its blades, especially if it be a large one. Its susceptibility of becoming dilated, is of the utmost value to the lithotomist; indeed, if it did not exist, and largely too, none but small stones could be withdrawn through any incision limited to the prostate only. But in order to take advantage of it, the dilatation must be made slowly and gently. If done hastily, harshly, and forcibly, under the influence possibly of the contemptible vanity of achieving a rapid operation in the eyes of bystanders, it is not dilatation which has been accomplished, but rupture. And by rupture I do not mean the mere enlargement of the wound in the prostate and neck of the bladder, which, probably, is often and legitimately occasioned, but the rupture of the surrounding cellular connections with the numerous veins and the capillary network which traverse them ; results of an extremely dangerous character. In this way, inflammation of the cellular tissue, pelvic abscess, or it may be phlebitis, are set up ; suppuration is produced in a situation where the pus finds its way to the peritoneum, and not to the surface. And when this state of things exists, a deep incision might have proved a safeguard rather than the contrary, by affording exit to the confined matter. It is wholly impossible, then, to overrate the importance of slowly and gently dilating the neck of the bladder and the incisions which have been already sufficiently made, and of giving abundance of time both in the act of introducing the forceps, and in that of withdrawing the stone. If there be any single proceeding in connection with the practice of Lithotomy, no matter what is the operation performed, which demands more than any other of care, attention, and self-command, I should say it is the manner in which we traverse with instruments the wound in the neck of the bladder. Nevertheless, one may have sometimes observed that the operator rapidly passes and repasses instrument after instrument, especially if any difficulty arise, and pulls and twists, with breathless haste and excitement, the calculus through the narrow outlet. Nothing can be more dangerous, nothing more likely to occasion the evils which have just been described. I am strongly inclined to think that in many hands the forceps, and not the knife, is the most deadly instrument employed in Lithotomy. On this important subject permit me to adduce here two brief quotations from the writings of two experienced and accomplished lithotomists, one of the past and one of the present age. Pouteau, during the last century in France, says :—"The extraction of the stone is, perhaps, the most delicate part of the operation, since it has often caused fatal results when it has been done without sufficient prudence and management. If we permit ourselves to be seduced by the dangerous merit of doing the operation in the shortest possible space of time, the eagerness with which extraction is made occasions a rupture, often mortal; and I am persuaded that the thoughtless anxiety to acquire this false glory, that the public attaches to rapidity in operating, has killed more patients than any other evil manœuvre. It is impossible to proceed too slowly in extracting the stone, and I believe it is to a scrupulous adherence to this precept, that I owe in great part the constant success of my operations."*

---

* Memoria sul Conduttore d'Hawkins, &c. Pavia, 1825.

---

* Med. Chir. Trans., vol. ii. p. 411. It seems necessary to state, from the manner in which Mr. Martineau's practice is sometimes quoted, that this series of eighty-four cases did not by any means constitute his entire experience, the remainder of which was by no means so successful.

† Cheselden's Anatomy, 5th edition, 1740, p. 231.

Dr. Keith, of Aberdeen, after describing the method in which the forceps is to be applied, adds :—"There are few operations to which the adage *Festina lente* does not apply. To Lithotomy it is especially suitable, and to this stage of it peculiarly applicable. At it, 'Make haste slowly' should be ringing constantly in the surgeon's ear."

I cannot forbear to add the remarkable fact that, in the numerous opportunities of discussing the details of the operation of Lithotomy, which I have enjoyed, either personally or by letter, with many of the most experienced lithotomists of the day, and I refer especially to the provincial surgeons of our own country, that this is the single particular on which all are agreed. One, possibly, may attribute his success almost entirely to the use of the beaked, instead of the pointed, knife; another, to the smallness of the internal incisions; a third, to the freedom of the same incisions; a fourth, to the invariable use of the tube after the operation; a fifth employing it only in rare and exceptional cases; but one and all agree in the vital importance of extracting the stone with great care and gentleness, and of giving time in abundance to this part of the proceeding. I may add, that Dr. Murray Humphry, of Cambridge, who has had a large and remarkably successful experience, attributes his success in great part to care in removing the stone. He writes me—after describing in detail his method of proceeding—"the desideratum in the operation is to extract the stone with as little damage as possible to the parts."

---

* Œuvres Posth., tome iii. p. 350.

2. Death after Lithotomy may result from rapidly spreading inflammation produced by urinary infiltration into the cellular interspaces between the pelvic viscera when they have been opened up by too deep incisions.

This result, although occurring sometimes, does so much less frequently I believe than is usually supposed. It is true that, at a post-mortem examination, after a large stone has been with difficulty extracted, the cellular connections of the neck and base of the bladder are found to be broken up; sloughs of the connective tissue appear bathed in fluid seropurulent and urinous, and marks of peritonitis, especially severe in the pelvis, are observed. But there is good reason to believe that, in most cases, urinary extravasation is not the primary cause of the inflammation, but that inflammation has been the occasion of the urinary extravasation. Cellulitis, produced by violence, has first destroyed the connections in the manner described above, and then the urine has rapidly infiltrated the disintegrated tissue, and has lighted up a virulent peritonitis, or intensified a previously existing one. Such appears to be the true explanation of the phenomena which mark the progress of events during the period, more or less brief, which follows the operation in many fatal cases.

Infiltration by no means necessarily occurs when urine passes over the newly made section of cellular *spaces* so called. In fact, cellular *interspaces* between muscles and between viscera do not exist, except when made by the anatomist for the necessary purpose of demonstrating the planes of cellular tissue which unite adjacent organs, and facilitate freedom of movement between them. I very much doubt if urinary infiltration ever occurs when they are otherwise uninjured, in a person of fair vigorous health. To judge from the language held respecting this subject, one would imagine that hollow intervals were found between the organs in question, over which urine had only to be poured in order to be drained mechanically into them. No such thing exists. In the child, where the cellular connections are of the loosest and most delicate kind, and where the bladder is active, powerful, and irritable, urine flows constantly after this operation over a cut surface which affords free access to them: nevertheless, with what extreme rarity do we meet with urinary infiltration in the child! But once inflame this cellular tissue, destroy its healthy character, or even, perhaps, let the patient be of unsound health, or one in whom "the flesh never heals well," to use a common phrase, and then we have the condition in which urinary infiltration may take place with rapid and fatal effect.

I am aware that this doctrine is opposed to the generally received notions on this subject. I speak with great respect for existing views, but careful pathological study of the subject by the bedside of the dying patient, and at the subsequent autopsy, has convinced me that the true cause of death in the majority of cases, the cause that it most behoves the operator to guard against, is violence in opening up the internal part of the wound, and laceration of the tissues there, and not the primary passage of urine into the cellular connections about the neck of the bladder. Happy is it if it be so, since the first it is in his power to avoid; the second is a danger which would be often inherent in the operation, and unavoidable with a stone much above the average size. That it is not an inherent necessity in the operation, seemed to me to be indicated in an early study of this difficult and important subject, by the fact that forty or fifty consecutive cases of Lithotomy might be cut, and have been cut, without a single casualty. If it were a fact that cellular interspaces could not be cut without the gravest risk to life, how could such a result be possibly accounted for? It was necessary to suspect the existence of a graver cause, and here the comparison of living phenomena with anatomical appearances led me to conclude that the cause is avoidable and not inherent. To sum up the subject; it appears that in the majority of cases death is due to unnecessary violence inflicted on the neck of the bladder and parts adjacent, occasioning destructive inflammation of the connective tissue, and of the network of minute bloodvessels which pervades it; and that when this has taken place, and not until then, does infiltration of urine occur, when it rapidly augments the danger. In some cases a small quantity of poisonous fluid, associated with, or resulting from, decomposed urine, probably enters the circulation by absorption, and produces those depressing constitutional symptoms which always accompany this accident; and are dangerous in proportion to the diminished capacity of the kidneys to eliminate the poisonous matter from the blood, and of the constitution itself to overcome the shock which it invariably sustains in these circumstances. Lastly, in all, or nearly all, instances, the irritating fluid soon reaches the peritoneum, and if the powers of life are not already exhausted, fatal peritonitis is the necessary consequence.

3. Fatal inflammation of the cellular connections of the bladder sometimes takes place when neither of the above-named causes are present.

Cellulitis may occur after any lesion in unhealthy or predisposed subjects; or where erysipelas is prevalent; and in this manner it sometimes undoubtedly attacks the connections of the bladder as a sequel to the incisions in Lithotomy, although they may be strictly confined within the limits which anatomy prescribes. This is the form which is more likely to prove fatal if calculous patients in hospitals are imprudently placed in crowded wards, or where erysipelas is rife, instead of, as has for many years been our practice in University College Hospital, to place them in a private ward, or in a ward with only six or eight beds, in which erysipelas rarely occurs, or is at once removed, if it does so.

II. Inflammation of the mucous membrane of the bladder itself, rapidly leading to inflammation of allied vital organs, is another cause of death after Lithotomy.

We have considered the effects of inflammation of tissues around and outside the bladder, as the most frequent cause of death after Lithotomy. The cause which appears to be next in order of frequency is inflammation within the bladder, namely, of the internal or mucous lining. And this condition also, like the preceding, while it must be regarded as a grave complication itself, may also become the medium by which inflammation extends to other organs, inducing a complication which is graver still. Thus, from cystitis may arise, and with extreme rapidity, inflammation of the kidney on the one hand; on the other, inflammation of the peritoneum. The first is generally announced by rigors; then follow vomiting, intense pain, suppression of urine, coma, and death in twenty-four, thirty-six, or forty-eight hours. The second is often more gradual and insidious in its progress; tenderness in the hypogastrium and a little fulness first exciting attention, the usual signs of low peritonitis following in their order. Among cases of this order perhaps are found the very few examples of recovery which do take place after peritonitis. With counter-irritation and hot applications externally, and opium internally, with nutritious support and stimulant, here and there a patient survives. Among the first class of cases, viz. those in which the renal implication, as exhibited by rigor and suppression of urine, has taken place, the principal chance lies in an early single cupping over the kidneys, followed by hot and stimulating applications to the loins. But if the renal organs have been the subjects of disease before, and it is more than probable that they have been so in the instances where this complication occurs, the prognosis is of the gravest character. The course of these latter cases somewhat resembles that which is exhibited by those belonging to the class next in order for consideration.

III. Death may occur after Lithotomy from absorption into the system of poisonous products derived from the urine.

In these circumstances, the fatal event sometimes takes place with great rapidity, a day or two after the operation; the symptoms suddenly appearing, and consisting mainly of very great prostration and diminished secretion of urine. There is every reason to suspect that the constitution is labouring under the effects of a violent and fatal poison suddenly absorbed. The active symptoms ushering in inflammation of the kidney, alluded to in the preceding section, are not present, but the patient rapidly exhibits the intensely prostrating effects of poison in the blood, which the emunctories of the body, but especially the kidneys, are unable to eliminate. It would appear in this case that it is not so much the mere inability of the kidney to perform its office of throwing off the natural excretion from the blood, and so permitting the poison to accumulate there, but that some products of decomposing urine and of unhealthy discharges, possibly from the neighbourhood of the wound, have been taken up into the system, and are poisoning it with intensely rapid and fatal action. And the elimination becomes still more difficult, or, indeed, impossible, if the kidneys have previously been the subjects of organic morbid change. Judging, at least, from analogous conditions in other circumstances, this seems to be the best explanation of the fatal phenomena presented. They are sometimes, but erroneously, I think, regarded as signs of shock and exhaustion. Such conditions occur doubtless, but in a manner which is distinct from this kind of fatal event. They will be considered in due course.

IV. Phlebitis and Pyæmia.—As all surgical operations are liable to give rise to these unhappy results, Lithotomy is not exempt. Pyæmia, however, undoubtedly ranks low in the list, happening unfrequently in comparison with other fatal issues. It has its origin probably in inflammation of some of the veins which are abundant about the neck of the bladder, and which are liable to injury by violence, rather than by section with the knife.

V. Death by shock is not unfrequently spoken of. I imagine that by this term it is desired to express that the event of operation produces so great an exhaustion of the nervous energy, that the action of the heart is rendered too feeble to sustain a circulation adequate to support life. The patient is the subject of collapse, just as we see in those cases in which the brain has suffered mechanical violence in concussion; just also as sometimes happens in extensive mutilations of the body, death occurs not from mechanical injury to vital parts, but from the profound impression upon the nervous centres, which extensive destruction of tissue produces. The operation of Lithotomy, particularly if protracted and severe, appears in some individuals to produce this effect of shock. It must be regarded as a rare termination; and it has probably become more rare since the employment of anæsthetic agents, because two great elements of nervous depression, dread of suffering, and endurance of suffering itself, are almost certainly eliminated. Shock, when it occurs, can therefore now be mainly due to physical injury, and not to emotional perturbation. Shock, then, is to be distinguished from those rapidly occurring terminations which have been already attributed to poisoning by urinary products, and to renal disease; as well as from that which is due to exhaustion, next to be named in the order of arrangement.

VI. Hæmorrhage and Exhaustion.—These two are placed together, for reasons which will appear. Death by primary hæmorrhage may be said almost never to occur in Lithotomy, that is, death directly due to loss of blood. For, first, hæmorrhage of a severe character rarely takes place. Secondly, if it does appear, it is usually controllable, either by the ligature, the tenaculum, the curved needle, plugging, cold, or by manual pressure. Secondary hæmorrhage sometimes takes place, and patients have been reduced to the lowest condition by it ; indeed, I have seen three instances of death which were due to it. But all this, let it be distinctly observed, suggests no inference to the practical surgeon that hæmorrhage is therefore not to be regarded as a dangerous, or even as an indirectly fatal, occurrence. On the contrary, free bleeding, continuous bleeding, and bleeding that tends to recur, are always to be regarded as circumstances of very evil augury for the well-doing of the patient. Such hæmorrhage lowers the powers of life, impairs the adhesive action in the wound, and therefore also the resisting power in the newly cut surfaces to the action of urine and other products passing over them. It diminishes the patient's power of resisting infection, or other deleterious influences which may be around him, and enervates him for the struggle with them, when it has commenced. Lastly, it may endanger, and in any case prolongs, the period of convalescence. In this view of the subject, then, hæmorrhage is inevitably allied to exhaustion, and exhaustion ought rarely to exist apart from this cause. There are some old and worn-out cases in which the slender chance of operation is accepted by the patient only in his last extremity; when being already exhausted, and with powers past recruiting, he must be brought to the operating table. These are exceptional, however; in most cases a patient should not, and need not, be submitted to this ordeal in an exhausted state. But if hæmorrhage be unavoidably severe, or be not checked by every means at hand, we shall risk a fatal encounter with exhaustion, and indirectly not a few deaths are thus met with. It is not easy, in these circumstances, to replenish the exhausted system. It results, then, that the surgeon should, during the operation, regard his patient's blood as valuable in the highest degree, and whatever may be his views respecting its loss under other circumstances, he should rest assured that every ounce of blood lost in Lithotomy is, *pro tanto*, a positive injury to his patient.

VII. Tetanus.—Two or three cases are on record of death by tetanus following the operation of Lithotomy. Beyond the bare mention of this fact, no further remark appears to be necessary respecting this extremely rare event as a consequence of the operation.

THE CAUSES OF DEATH IN CHILDREN.—The causes of death in children are widely different from those which are met with in adults. This distinction, as far as I can ascertain, has not, as yet, been sufficiently pointed out. The causes of death after Lithotomy have been treated as if they were uniform at all ages; although it is very obvious from observation of their cases, that the fatal result in the adult and in the child almost always happens through a different chain of events. This has rendered less distinct in each respectively the danger to be most feared, and, consequently, the cause most to be avoided.

On investigating this subject in the adult, we have seen that haste and violence in extracting the stone, and sometimes unnecessarily extended incisions, are the causes of that diffuse inflammation of the cellular connections around the base of the bladder, which proves so generally fatal. We shall find in the child that the danger is not, or is very rarely, due to diffuse inflammation, and that incisions beyond the prostate can scarcely be reckoned dangerous, since they are constantly practised, yet no class of patients exhibits half so many recoveries per cent. We shall find that the most frequent cause of death in children is peritonitis, which is by no means common in the adult; and after that, and nearly as frequent, is constitutional exhaustion.

It will make our path clearer if we first consider the causes which render Lateral Lithotomy so much less fatal in the child than in the adult, a fact notorious to the youngest student of surgery. I believe them to be threefold. First; Lithotomy is not a very fatal operation in the child because the sexual organs are not yet endowed with that special sensibility, the development of which constitutes the state of puberty; a sensibility which, depending on most intimate connection between those organs and the cerebro-spinal system, necessarily associates them by the closest ties with all the other vital functions in the economy. So that any shock or injury received by the adult sexual apparatus very frequently involves constitutional sympathies of a very grave character. In the child there is, in fact, no sexual apparatus; that is to say, its condition is at present rudimentary, and the young patient is exempt from the danger which exists in the circumstances pointed out. This is the first and the chief fact in favour of the child. The second consists in this; that the processes of growth, and, consequently, of repair, are more vigorous during childhood than during any other term of life; and injuries are more rapidly and more easily surmounted than when those processes are less active. There are special adverse influences at certain periods of childhood, which counteract, to some extent, the beneficial effect of this, as we shall presently see. Thirdly, the position of the bladder in children favours the continuous and complete discharge of urine, and of all noxious secretions after operation, a fact which is doubtless of some value in their cases.

Now, the liability to death after the operation of Lithotomy in childhood varies very much at different epochs of that period. A table in another part of this work containing 850 cases of children, shows that, from the first to the fifth year inclusive, the deaths are about one in fourteen cases: they then decrease, so that between six and ten years inclusive, they are only one in twenty-three or twenty-four cases. Between eleven and sixteen the mortality gradually rises to one in nine-and-a-half cases, and from the sixteenth to the twentieth year to one in seven cases.

During the first three or four years of life Lithotomy is far less successful than during the subsequent period. The first dentition with its dangers is now encountered, and the excitable nervous system of infancy neutralizes some of the advantage which arises from the reparative power of childhood already referred to. But as these two constant sources of disease and death during the earliest years cease to be effective, we find the boy of six to ten years but very slightly exposed to risk from Lithotomy, the mortality being one in twenty-three or twenty-four cases, or little over four per cent. The development of puberty shows its influence in a marked manner between twelve and sixteen, and during the first onset of its influence on the system between sixteen and twenty, before the man is fully developed, and before the body has become established and fortified, Lithotomy is slightly more hazardous than at any period during the subsequent twenty years.

It has been already stated that the most frequent cause of death in children is peritonitis. The bladder in children is an abdominal organ rather than a pelvic one, and has more intimate relations with the peritoneum than the bladder of the adult possesses. On examining its structure also, it is easily seen that the peritoneum is more entitled to its anatomical distinction of constituting one of the vesical coats in the child than in the adult. Hence, violence in extraction tells much more readily and directly on the peritoneum in the former than in the latter. In the adult we have seen that if the peritoneum is inflamed, it is rather by an extension through primary inflammation of the cellular tissue around the neck of the bladder, than by direct irritation occasioned by the operation. The converse condition is the rule with children. The undue manipulation of instruments in the cavity of the bladder, or exertion in withdrawing the stone, appear to excite peritoneal inflammation much more readily than any other lesion. That it does not happen in children by the intermediate step of urinary infiltration, is obvious from the fact that the prostate in them is so exceedingly small, as to be almost always, if not invariably, cut wholly through in Lateral Lithotomy, yet without the occurrence of that accident. Indeed, it is not possible that either forceps or finger can pass into the bladder, unless the incision exceeds the thickness of that organ. In considering this matter there appears to be a tendency to forget a fact I have already alluded to, viz. the non-existence at this period, except in a rudimentary form, of any sexual organs. I have dissected many prostates in children; the size of one at seven years, let us add therefore at the most favourable age for Lithotomy, may be estimated from the fact that it weighs about thirty grains, while between eighteen and twenty years it weighs two hundred and fifty grains, or nearly nine times as much. And yet no infiltration of urine takes place; lax, delicate, and yielding as are the cellular connections necessarily exposed in these subjects.

Here then, again, as in the adult, the fatal injury from the operation is more commonly due to violence than to any other cause, but telling directly on the peritoneum, rather than on the cellular connections of the bladder. Such is the inference I deduce from the study of numerous cases of death in children, respecting which I have been in a position to form opinions. Some corroboration of the views here put forth may be found also in the fact respecting deaths which have been known occasionally to follow the mere act of sounding in children: viz. that it is always due to peritonitis. Fletcher, of Gloucester, in his most instructive record of "Failures in Lithotomy,"* relates the case of a child, six years old, and in excellent health, who died of acute peritonitis in three or four days, after a prolonged sounding for suspected stone. Mr. Crosse also mentions a case precisely similar.†

The next cause of death is exhaustion. Young children bear the loss of blood badly, and when it is considerable, an occurrence which, however, is rare, the patient sometimes sinks from subsequent exhaustion. The condition of calculous children also, if the stone has long existed, is occasionally low in the extreme, and they gradually sink without any apparent effort to rally, no active attack having declared itself.

---

* Med. Chir. Notes and Illustrations, Part I. Lond. 1831, p 89.

† Treatise on Calculus. Lond. 1835, p. 43.

Besides these two principal causes of death, there are occasional examples of fatal result from shock after very prolonged or severe operation; from disease of the kidneys and bladder, from phlebitis and intrapelvic abscess, which demand no special remark here.

CHAPTER VI.

DIFFICULTIES AND DANGERS MET WITH IN LITHOTOMY.

1. Difficulties and Dangers peculiar to the Age of the Patient—those of Infancy.—In Age, Rigidity of Tissues; Enlargement of Prostate, &c. 2. Difficulties from Personal Peculiarity in the Subject—Deep Perineum; Narrow Pelvis; Unusual Distribution of Arteries; &c. 3. Difficulties due to Peculiarity in the Stone—Size; Form; Number; Situation; Encysted Calculi; Contraction of Bladder on Stone. Calculi adhering to the Bladder. Accidents—Wound of Rectum; Removal of Portion of Prostate; Fragments remaining after Operation; Secondary Hæmorrhage; Wound remaining Fistulous; Impotence; Incontinence of Urine; no Stone found at Operation.

THERE are several exceptional circumstances, any one of which may, when present, become an occasion of more than ordinary difficulty to the surgeon in the performance of Perineal Lithotomy. Furthermore, it is certain that the degree of difficulty for the surgeon must be generally regarded as the measure of danger to the patient. There is therefore no duty more necessary, and certainly there is no inquiry more interesting, than that which relates to the sources of such difficulty and danger; because most, if not all of them, may be discovered and identified, not, indeed, by a reference to the practice of any single lithotomist, but by an extended research into the experiences of many. And the value of this inquiry will appear from a fact, the validity of which will be admitted by all, namely, that to be forewarned of the presence of difficulty, and prepared to meet it, diminishes, by one-half, its magnitude in most cases.

For the sake of convenience I shall arrange these difficulties in three classes.

First, difficulties which are peculiar to the age of the patient.

Secondly, difficulties which arise from peculiarity in the subject—and

Thirdly, difficulties which arise from some peculiarity in the stone, or in its relation to the bladder itself.

First, difficulties which are peculiar to the age of the patient. The period of infancy is one which presents peculiar difficulties to the operator, difficulties not present at any other period of life. The structure of the organs interested is extremely soft and yielding; and the connective tissue which unites them is lax and feeble to a remarkable degree. From this condition arise two sources of difficulty and danger, which the operator has not unfrequently to encounter. First, the staff is liable, if undue force be used, to be pushed through the walls of the urethra, commonly at some point in its floor below the pubic arch, and thus to find its way below the bladder, between it and the rectum, where the mobility of the instrument, permitted by the laxness of the cellular connections there, may lead the operator to believe that its point is in the bladder itself. The same thing may happen in the adult; but from the cause stated, co-existing with the sharp curve upwards of the urethra in this situation in the child, it more readily happens in the latter. If this error is made, and is not discovered in time, the operation fails to extract the stone, and almost invariably inflicts a fatal blow on the patient. And its not unfrequent occurrence proves that it is by no means a remotely possible danger. There is one great rule which, as far as I know, is the only absolute safeguard against the performance of an operation on a staff which has not been passed into the bladder; and it is, *to require clear audible or tactile proof of contact between the stone and the staff, on which the patient is to be cut.* We may find the stone with a sound, while the patient is on the table, but the staff may be passed immediately afterwards with perfect ease and not find it, the difference of form in the two instruments being considered sufficient by the operator to account for the two different results. It is wise not to be so easily satisfied. I have known occurrences of which the following is an illustration. A patient having marked symptoms of stone had been repeatedly sounded in the country, but no stone was found. The instrument which had been employed for the purpose had the curve of an ordinary catheter. He was sent to London, and was there sounded with the small-beaked sound, which at once struck a stone in the bladder. Placed on the operating table, the staff passed easily; clear contact with the stone was not demonstrated, but the incisions were made. Until then there was no suspicion that the staff was not in the bladder; but it was soon discerned to be in a false passage, one which had been made, no doubt, by the large-curved sound, at the repeated examinations referred to; the opening of this false route having been avoided by the beaked sound, but entered by the staff. Happily, the operator was able to withdraw the staff, introduce it into the bladder, and continue the operation, which was a successful one. When such an occurrence is met with, this is the course to be pursued; the surgeon must not hesitate an instant to withdraw his staff, to slide another staff of any curve that will pass safely into the bladder and detect the stone there, and then to finish the operation upon it. But if, owing to the false passage, he can pass no instrument after a fair amount of endeavour, all proceedings should be suspended without any further use of the knife until another day.

The other difficulty which arises in these cases from the soft and lax nature of the tissues, is the facility with which the membranous urethra may be separated from the prostate. This sometimes happens, when, after the deep incision, an attempt to introduce the index finger into the urethra fails, and issues instead, in pushing onwards the prostate and neck of the bladder until separation takes place. The accident may occur in two ways. The operator may, through fear of having his deep incision too free, make a section of the urethra and prostate insufficient to admit the tip of his finger, and in attempting to dilate the opening with it instead of incising afresh, the catastrophe occurs. Or, from this insufficient incision, as Dr. Murray Humphrey points out,* the forefinger of the surgeon may, in failing to enter the urethra, make a kind of cavity between the bladder and rectum, and he may believe that he is in the first-named cavity. He may pass the forceps into this, and even feel the stone, thinly covered by the coats of the bladder, and attempt to make extraction. But, secondly, in the act of opening the membranous urethra, he may lose his hold upon it with the nail of the left index finger, and repeat the incision once, or even twice, before he fairly gets his knife into the groove of the staff, and runs it on towards the bladder. The urethra meantime may have shifted its position slightly, and three or four adjacent separate notches have been made into it. If only a small amount of force be employed in the subsequent attempt to pass the finger into the urethra, its separation from the prostate may also take place. This source of danger has been pointed out by Sir William Fergusson in some valuable clinical remarks on the operation in children.*

---

* *See* Lecture in the *Lancet*, April 23, 1864.

The remedy, when this accident has occurred, is first to ascertain that the point of the staff is still in the bladder, and then to make a free incision of the prostate with a sharp knife—for these soft tissues are not easy to cut, and require both point and edge for a perfect section—so that the finger may be introduced into the cavity: this will generally be successful. A pre-acquaintance with the danger, however, will be the best safeguard against its occurrence.

A difficulty which sometimes presents itself in the cases of children (very rarely in adults) is prolapsus of the rectum during the operation. Young calculous patients are frequently subject to this affection from the straining which their complaint occasions, and when a considerable protrusion occurs at the moment of operating, some embarrassment may be occasioned. All that is necessary, however, is to press up the bowel without haste, so as to ensure its fair return, to put a pad on the anus, and direct an assistant, placed on the patient's right side, to keep his finger firmly on the pad until the operation is completed.

The other extreme of life is also liable to its peculiar difficulties. There are two which are met with, and only in elderly subjects; namely, unusual rigidity of the neck of the bladder, and hypertrophied prostate.

---

* Lecture, *Lancet*, July 2, 1864.

The first has been less generally regarded than perhaps it deserves to be. In many elderly subjects, the fibrous structures which form the neck of the bladder, and enter into the composition of the prostate and surrounding parts, have become unnaturally rigid and unyielding. In early life the converse condition exists, hence the impunity with which considerable dilatation can then be made. This condition of rigidity varies much in degree in different subjects, and is quite distinct from hypertrophied prostate, but as a rule it corresponds more or less to the advance of age: there are, however, some exceptions. In a marked case the tissues yield little to the finger, or to the forceps; the opening sufficient for the removal of a stone of given size in ordinary cases here feels tense, and inadequate for its purpose. The forceps being introduced, it is perceived that dilatation is not taking place, and unless deeper incision is employed the stone cannot be extracted without violence. In either case risk is incurred by violent laceration, or by extended incision; the smaller risk, however, probably lies, in careful hands, with the latter, although it is undoubtedly true that more force is admissible in this condition than in the normal state of the tissues. It is referred to by Mr. Crichton, in his MS. notes, as usually associated with enlarged prostate, and while he enlarged his incisions he did not hesitate to use more force in extracting than he was ordinarily accustomed to employ. Civiale has remarked its existence, and regards it as diminishing the prospects of success; where this condition is marked, and the stone is large, a second incision may be made through the right side of the prostate, supposing that in the left to be already sufficiently free. This was Liston's practice at University College Hospital; he performed it in 9 cases there for very large stones with 7 recoveries; among them was one stone weighing 3¾ ounces, and another of 4½ ounces.

The prostate enlarged by hypertrophy, or deformed by tumour, is another difficulty presented by age. I am not disposed, however, to rank it high in the scale either of difficulty or of danger. It sometimes prevents the forefinger from entering the bladder; it increases the distance between the operator and the stone, and so augments the difficulty of seizing and extracting it; and it does the same by placing the stone in a disadvantageous position, that is, lying deeply behind the neck, or there may be projecting tumours at the entrance of the bladder, situated between the stone and the inner end of the wound. Hence such tumours have not unfrequently been torn away by the forceps in the process of removal, and apparently without any additional risk. On the other hand, deep internal incisions in an enlarged prostate are comparatively free from danger, and there is no fear of reaching its external limit. The gorget is a safe and efficient instrument in these cases for extending the deep incision; it forms a conductor for the forceps into the bladder when the finger cannot reach it, and keeps projecting tumours out of the blades, which might otherwise be lacerated, or brought away in their grasp. When the stone lies deeply behind an enlarged prostate, the curved forceps may be useful, although I have rarely found more than one pair of straight forceps necessary in any case. Sometimes the stone may be brought into good position for extraction, by placing one or two fingers in the rectum, and raising the stone towards the level of the internal wound.

In elderly subjects, also, it occasionally happens that the bladder has become atonied, and has not been able to empty itself by its own efforts for a long period of time. In the gush of water outwards after the deep incision, the bladder collapses rather than contracts, and the stone may be enveloped in folds of the organ, a circumstance sometimes productive of much trouble. Careful manipulation of the forceps, or better still of the scoop, with pressure by an assistant on the hypogastric region, will generally enable the surgeon to reach and remove it. In these cases, however, it appears to be wiser to operate with a nearly empty bladder than a full one; the stone is then more likely to be found at the neck, close to the internal incision.

2. Difficulties which arise from some personal peculiarity in the subject.

Among the first in this category may be noticed the deep perineum. Sometimes this is constituted by a variety of formation in which the bladder is more deeply placed as regards the surface than in ordinary cases: and resulting most commonly from unusual depth in the ischia and pubic rami. The difficulty is also commonly presented when the patient is exceedingly stout, the layer of adipose tissue over the perineum, and especially on the nates, sometimes adding very materially to the distance between the surface and the bladder. In this case it is necessary to make the external incision longer in proportion at both extremities, remembering that the incision in such a subject commences on a plane three-quarters of an inch to an inch further from the bladder than in an ordinary case. Otherwise, the wound will be too narrow in proportion to its depth, and will be dangerously so should the stone be a large one. The remarks respecting the use of the blunt gorget in cases of hypertrophied prostate apply here also.

Another difficulty is presented by the unduly narrow pelvis. The pelvic outlet may be congenitally contracted, or it may be deformed by rickets. Cases are on record in which it was impossible to bring any stone through the outlet, but such are extremely rare. Still it is not so uncommon to find the passage sufficiently narrowed to occasion some difficulty in extracting a stone of moderate or large size. The distance between the two ischial tuberosities is always a matter of observation to the lithotomist before operating, and his incisions are placed so as to allow him a fair equal distance between the rectum in the middle line and the osseous boundary on the outer side. But this is not all; it is particularly desirable in such cases to present, in the act of withdrawing the stone, which has usually a short, as well as a long diameter, the short one to the narrow diameter of the pelvis.

In the case of a boy four-and-a-half years old, this difficulty occurred to myself, at the time of the operation, not having observed it previously. There was a large stone, and having made the incision by the lateral method, I found unusual difficulty in extraction. An unsuccessful attempt had been made before, but the cause of difficulty then I was not aware of. However, with management, I safely removed it in a few minutes. Ultimately the child died. At the examination the pelvis was removed: there was so much distortion, due to rickets, that the anteroposterior diameter measured only seven-eighths of an inch, on the dry specimen; while the calculus was almost three-quarters of an inch thick, being one inch and an eighth long, and seven-eighths of an inch broad. Had this condition been discovered beforehand, no doubt the suprapubic operation might have been performed with advantage. The case was published in the "Medical and Chirurgical Transactions," vol. 47, with a drawing of the pelvis and of the stone. Sir Astley Cooper speaks of a case in which Clive found the ischia so abnormally approximated, that having introduced the forceps and seized the stone he was unable to withdraw, and consequently broke it and removed the fragments separately.*

Another case observed, but not operated upon, is recorded by Mr. Bransby Cooper.†

Other difficulties peculiar to the subject are, the unusual distribution of the vessels, rendering serious hæmorrhage unavoidable; the existence of the hæmorrhagic diathesis; the presence of organic disease in the kidneys or elsewhere; of extremely nervous or irritable temperament; of plethora, obesity and debility combined, a not uncommon, but most unpromising, condition; and lastly, of great exhaustion from long-continued suffering. The unusual distribution of arteries referred to is a difficulty which cannot be foreseen or avoided. The pudic trunk being defective, its place is sometimes supplied by an "accessory pudic," which lies close to the border of the prostate; the arteries of the bulb may be given off further back than usual; the main artery of the prostate itself may also enter the gland in a situation exposing it to the knife in Lithotomy. In all these cases, the skill, the energy, and the patience of the surgeon, may be taxed to their utmost, to arrest the hæmorrhage occasioned by the division of these deeply lying vessels: see remarks on hæmorrhage at page 43. The other conditions named above will be briefly referred to in the final appreciation of various methods of treating varied classes of patients.

---

* Lectures on Principles and Practice of Surgery. By B. B. Cooper. London, 1851, p. 601.

† Op. Cit., p. 599.

3. The third class of difficulties encountered in Lithotomy comprises those which are due to peculiarities in the stone, or in its relations with the bladder itself. Other things being equal, it has usually been held, and it was proved by Mr. Crosse, of Norwich, in his comprehensive view of the contents of the Norwich Museum, that, after moderate dimensions are exceeded, the danger and difficulty of the case exist in proportion to the size of the calculus to be removed. In other words, danger and difficulty exist in proportion to the extent of the incisions, or to the degree of violence employed in extraction. Thus, reckoning all the examples in that museum, he showed that the proportion of deaths to cures when the stone was between one and two ounces in weight, equalled about one to five and a half cases; when between two and three ounces, it was about four to five cases: and of the twenty calculi above that size, viz. from three so seven ounces, twelve died and only eight recovered. This rate of mortality must be considered rather high. On the other hand, if we turn to the practice of Mr. Crichton, a remarkable success in this class of patients is exhibited. In the records which I possess of his practice, I find no less than eleven cases, in which he removed, by the lateral operation, stones weighing upwards of four ounces, most of the

patients being very feeble and broken down in health. Among them were only two deaths.

No. 1,	aged 73,	weighing	4 ounces,	cured.
2,	„ 60,	„	4¼ „	do.
3,	elderly,	„	4½ „	do.
4,	„ 70,	„	5 „	do.
5,	„ 66,	„	5 „	do.
6,	„ 65,	„	5½ „	do.
7,	„ 40,	„	6 „	do.
8,	„ 45,	„	6 „	do.
9,	„ 72,	„	6½ „	do.
10,	about 65,	„	7 „	death
11,	„ 55,	„	8 or 9 „	Broke in extraction, largest fragment weighed 6 ounces, 2 or 3 ounces of débris besides; died on third day.

The greater part of these were cut during the earlier half of Mr. Crichton's career, when he opened the bladder with the cutting gorget, and in some he divided the right side of the prostate as well. His method was, as we have already seen, marked by freedom of incision in these circumstances, and care in extraction. In order to get as firm a hold as possible, after having adjusted the position of the calculus in the forceps, he was accustomed to slip up by the side and over the end of it, a bent hook or scoop in order to make traction and prevent slipping. Two only of the foregoing series were purposely broken into fragments before extracting, and in each case it was done by simply compressing the handles of the stout and strong forceps which the operator was accustomed to use, and not by means of any unusual or complicated instrument.

These results demonstrate what the lateral operation is capable of effecting in the removal of large calculi.

FIG. 46.

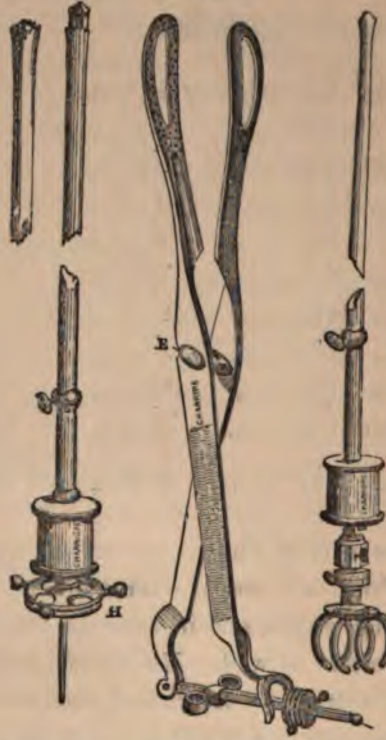


Fig. 46. French forceps, with a screw in the handles, for breaking large stones. An apparatus is used for drilling the stone, if the forceps cannot crush it. The figure on each side of the centre represents a perforator, which is introduced through a ring at E, passes between the blades, and is worked in the one case by a drill bow, and in the other by the wheel H.

Nevertheless, both in London and in Paris, it has been a common custom to employ for stones of about four ounces and upwards, some special apparatus for fracturing the calculus in order to extract the fragments through a smaller wound than would be necessary for the entire stone, (*see* page 114, and also fig. 47, and fig. 48). This principle of action is dictated by prudence. To limit the incision as much as possible, without doubt conduces to the safety of

Fig. 47.

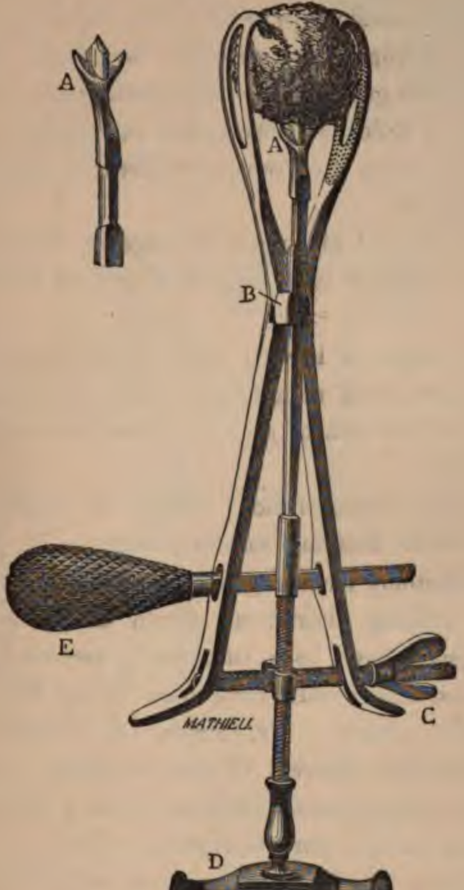


Fig. 47. Another instrument for the same purpose, acting by pressure and by drilling. A, the toothed extremity of the drill.

the patient. Still, it is impossible not to be aware that great additional hazard is involved in the employment of such apparatus in the bladder; and in contemplating it for any particular case, this must not be overlooked. I have witnessed its application more than once, and have been impressed with difficulties arising from three causes:—

1. The manipulation requisite for fixing the stone securely in the grasp of the instrument when the bladder is emptied of fluid, as it invariably is, and for crushing it subsequently, must be always considerable, and liable to produce mischief.

2. The removal of numerous angular fragments from the empty bladder is a fruitful source of severe injury to it.

3. The danger of leaving some small fragment in the cavity renders much manipulation and much washing-out necessary, or the risk of a second formation may possibly be incurred.

These grave considerations should be weighed by the operator before deciding on any course. In performing Lateral Lithotomy for a large stone, a well-constructed and powerful crushing instrument should undoubtedly be at hand. Stones have been successfully removed by such means which never could have been brought through the pelvic outlet entire. Mr. Mayo, of Winchester, thus accomplished the removal of one weighing 14¼ ounces, avoirdupois; the patient recovering with a small fistula.* Instruments for this purpose existed at a very early period in the history of Lithotomy; even before the time of Celsus, who refers to the practice.† Ambrose Paré describes his improved forceps, with screw-power in the handles, in order to crush the stone before removing it.‡ Le Cat modified them, and invented an instrument for perforating

---

* Med. Chir. Trans., vol. xi. 1821, p. 54.

† Celsus, De Medicinâ, lib. vii. cap. 26.

‡ Paré's Works, lib. xvii. cap. 42.

FIG. 48.

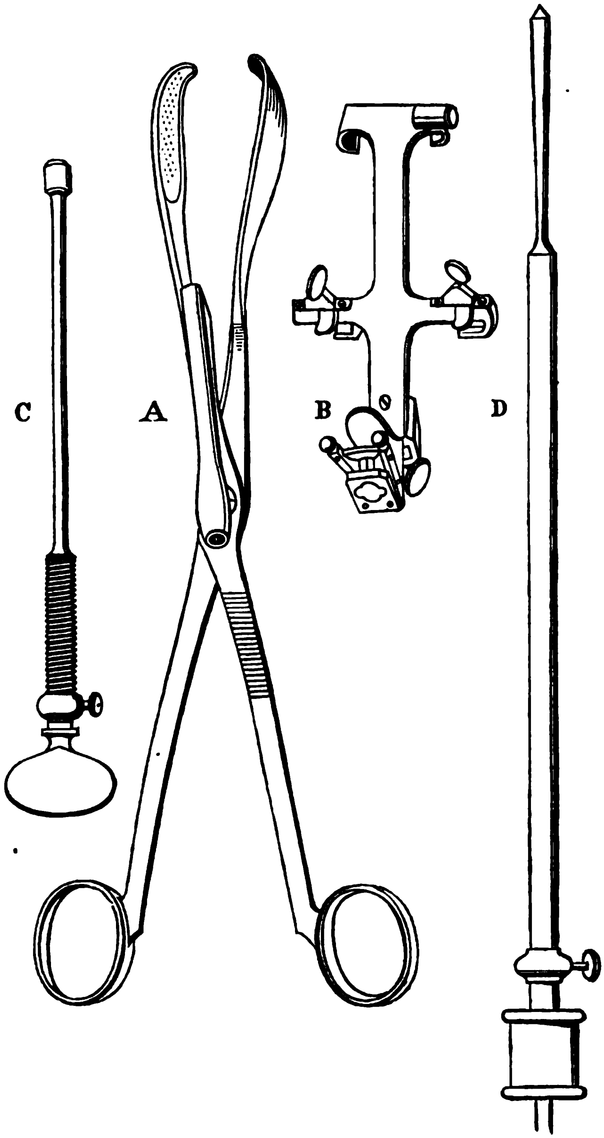


Fig. 48. Apparatus for crushing the stone before withdrawing it in the operation of Lithotomy. A. The forceps. B. Portion applied to the handle of the forceps, and fixed there by screws, into which the piece C is inserted. C. Fixes the position of the stone between the blades of the forceps. D. A drill, introduced through the tube seen on the upper blade of the forceps, which being turned either by hand, or by a bow, perforates and breaks up the stone.

the stone also; his instruments, especially those with which he made the incisions, were extremely complicated.* Of late years numerous attempts have been made to improve these instruments, commencing with those of Mr. Earle.† The best now existing is, perhaps, that which was employed by Civiale during the last three or four years of his life. Consisting of a pair of forceps, it enables the operator to fix securely the stone between the blades, before employing the drill to perforate and split it into fragments. From the form and nature of its action, it happens frequently that a large portion of the fragments may be retained between the blades, and withdrawn at once. Civiale reports between twenty and thirty instances of its application, and states that the results were extremely successful. The annexed drawing (page 113) is from an instrument in my possession which he sent me in 1867. He combined its use with the medio-bilateral operation, for all calculi weighing an ounce and a half, or thereabouts, and upwards.‡

For the removal of extremely large stones, weighing from four to six or more ounces, the choice rests, perhaps, between Lateral Lithotomy with this adjunct, the High, and the Recto-vesical operations. If the bladder is capable of being distended with urine, so as to be fairly appreciable somewhat above the level of the pubic symphysis, a stone of unusual dimensions may probably be more safely removed entire in this situation than by adopting the plan of crushing it after the lateral operation is performed. The great source of difficulty and danger in the latter mode is *the empty state of the bladder*, and I believe it is scarcely realized by those who have merely made or designed instruments for the purpose, and who appear to have overlooked the important distinction between this condition and that which obtains in ordinary Lithotrity, where fluid is always present. But if the bladder is habitually contracted round the stone, and does not admit of distension by fluid; if it cannot, therefore, be found reaching the level of the symphysis,. those who are most acquainted with the high operation tell us that it is by no means a safe operation to undertake in such circumstances. And it appears to be more common to meet with a contracted bladder than with a dilated one when a stone of unusual magnitude is present. Such was the condition of things in a case which was under my own care in 1857, and from which I possess two calculi weighing 12½ ounces.* These formed, for all the purposes of operation, but one calculus, being so closely locked together that it is scarcely possible that either could have been removed separately. The patient was in so miserable a condition when he came under my notice that I could not advise any operative measures, and attempted only to palliate it, and perhaps enable him to regain some vigour. This, however, proved impossible; his urinary organs being all but destroyed by long-existing chronic inflammation. At the autopsy I endeavoured to remove the mass by the high operation, and found it totally impossible, without opening the abdominal cavity. The bladder had long ceased to be a receptacle for urine, which trickled off as fast as it arrived from the kidneys; the stones being closely enveloped by its thickened and diseased coats. I doubt if any operative means would have been successful in his case; but judging from the examination referred to, it appeared to me that the best chance would have been offered by practising extended incisions on the plan of the Recto-vesical operation. This latter procedure must be regarded, for the majority of cases, as permitting the largest opening with the smallest amount of risk for stones which are unusually large. In the method of performing it, described at page 66, little danger exists from hæmorrhage; the amount of tissue cut is by no means considerable; and the opening is admirably situated, in the very centre of the pelvic outlet. On the other hand, a strong probability exists of the subsequent occurrence of intractable recto-vesical fistula. Experience of this operation has shown that this distressing condition follows, taking all cases together, about once in four or five instances. But when it is resorted to for stones of extreme magnitude, the chances are somewhat greater still that the wound will remain fistulous.

---

* Parallèle de la Taille laterale. 1766. See Plates and Descriptions at the end.

† Med. Chir. Trans., vol. xi. 1821. With a Plate.

‡ La Lithotritie et la Taille. Paris, 1870. pp. 440 *et seq.*

---

* Trans. Path. Soc., vol. ix. p. 295.

There is a practical point of importance to be noticed in connection with very large stones. It is the very slight evidence which can be obtained of their presence by sounding in certain cases. I first became aware of this on examining the patient just alluded to. I was convinced from his symptoms that he was the subject of calculus; but still, although repeatedly sounded by me and by one or two others, distinct evidence of the fact was at first wanting, for a clear note could not be obtained. A sensation indicating the presence of mortar-like matter was felt, on the instrument passing through the neck of the bladder, and after that, nothing.

I find in Mr. Crichton's notes the record of a similar fact. In one of his earliest cases, occurring in March, 1792, the signs, he says, were very indistinct; and, on his proposing to operate, one of the surgeons who had come to assist him left the room, stating that he could not be a party to any operation in such circumstances. Mr. Crichton, however, felt satisfied that a stone was present: operated at once, and removed a hard one weighing six ounces, the patient making a good recovery. He records also a second case almost parallel with the foregoing.

Other characters of the stone causing difficulty to the operator are, unusual form and extreme brittleness. A long stone, and a thin, flat stone, are both difficult to remove, and require careful adjustment in the forceps, or the aid of the scoop, before attempting to extract. I have also had the opportunity of observing that such stones are especially difficult to seize with the Lithotrite. Large round tuberculated stones are also formidable, and for equal weights are obviously much more so than smooth oval stones. A stone, also, which easily crumbles into fragments is always a source of trouble and anxiety. It prolongs the operation, makes much instrumental manipulation necessary, and the fear of leaving a fragment behind is always present. The scoop and the syringe as a rule afford the best means generally of dealing with these cases. The syringe should have a nozzle like that represented at fig. 7, page 18; a form for which we are indebted to Dr. Gross of America. On this account it is that Lithotomy, after the failure of Lithotrity, is sometimes associated with risk and difficulty, and especially if the bladder has proved irritable previously. Similarly, multiple calculi are sources of some difficulty, although less so than are numerous fragments. Instances of two, three, or four calculi are common. I have seen upwards of eighty in a single bladder. Examples of between one and two or three hundred are on record. Next to great size, the unusual situation of a calculus may be a source of much difficulty and embarrassment. A certain proportion of calculi become encysted in the bladder. Not so many, perhaps, as the statements made by operators who have found difficulty in extracting calculi, and who have consequently believed them to be encysted, would lead us to infer. But we have the best anatomical evidence that it is not extremely rare for this to happen. A calculus may be altogether contained in a cyst in the bladder, a small part of its surface only being exposed at the mouth of the cyst. I had the opportunity of watching at University College Hospital an example of this, which was once, and once only, struck with a sound during life, although sounding was repeatedly performed. The patient remained during a large part of 1850 under the care of Mr. Arnott; at death the condition described was found, and it was then obvious that the chance of striking such a calculus was exceedingly remote, and that no operation could have removed it.*

But it is not uncommon, when this condition occurs, that fresh calculous matter is added, little by little, to the exposed surface, so that, in process of time, a calculus is formed, protruding into the bladder, in which situation it increases in size; a narrow neck exists uniting the vesical to the encysted portion, and the whole acquires a form somewhat resembling that of an hour-glass.

One of the most interesting examples on record is that of a man, aged fifty-one, with stone, who applied to Dr. Murray Humphrey, of Cambridge, who operated by Lateral Lithotomy, removing a large one. Two years and a quarter afterwards, symptoms having recently appeared, Dr. Humphrey performed Lithotrity three times, but this being unsuccessful he cut him again in the same spot. Two years and a half after he came again with recent symptoms, and Lateral Lithotomy was again successfully performed. In the next year he again complained, and Lateral Lithotomy was adopted a fourth time, still in the site of the old cicatrix, but an encysted stone was discovered, and after many attempts could not be extracted owing to its distance from the wound. In six months he once more showed himself, and this time Dr. Humphrey did the recto-vesical operation: was able to reach the cyst, incised the sac with a hernia knife, dilated it with the tip of his finger, and, with much difficulty, guided the forceps, extracting a stone the size of a walnut. Death occurred in two days with peritonitis. At the autopsy, the sac was found just above the entrance of the right ureter; it was ulcerated at the lower part, and urine had found its way from it under the peritoneum. A second case fell to the lot of Dr. Humphrey, in which, at the second lateral operation, he discovered a cyst behind the prostate; he lengthened his incision, applied a probe-pointed knife to the neck of the sac, and emptied it of softish material with the scoop, and a portion or two by the dressing forceps a day or two after; the patient did well and continued so.*

---

* Very fine examples of encysted calculus are contained in the Museum of the Royal College of Surgeons. See preparations Nos. 2019, 2020, 2021.

I exhibited at the Pathological Society, in 1861, for Mr. Cadge, of Norwich, a good specimen of encysted calculus. It was removed by him during life with a portion of the cyst adhering, like a collar to the neck, uniting the two portions, and the patient recovered.* Two such cases occurred in Mr. Crichton's practice, who minutely describes his proceedings in the MS. notes; one case in 1842, one in 1844. In all three cases the stone was situated near the neck of the bladder, and in the two latter on the right side. Mr. Crichton says of each patient that he observed when sounding, which he repeated two or three times, the signs being rather indistinct, that the stone seemed always to be fixed at the right side of the bladder. He writes: "The bladder was cut into, and the presenting portion of the stone laid hold of by the forceps and quickly extracted, broken off at the neck: a grooved director was then introduced into the bladder, and insinuated between the edge of the sac and the encysted portion of the stone, which, by a little perseverance, was so much raised from its confinement as to allow the forceps to get a hold, and another portion broken off and extracted. This was several times repeated till the whole was brought away." The same proceeding was adopted in both cases; and both recovered. Very recently Mr. Lawson presented a good example of encysted calculus at the Pathological Society, which he had removed with the forceps aided by the scoop; in this case it was partially contained in a sac, and no supplementary portion projected from it.†

---

* Report of some cases of operation. By G. M. Humphrey, M.D., F.R.C.S., Surgeon to Addenbrooke's Hospital, Cambridge. London, 1856.

The following is a brief account of a case which I operated on in May 1869:—

A gentleman aged seventy-four years, had suffered for some years with very painful symptoms. I sounded him, found a large stone, and proposed Lithotomy. Having cut him by the lateral method, and extracted a rather large phosphatic stone and many loose fragments, I then explored the bladder, and felt a rough surface like calculus, which I ultimately was able just to reach with my finger, situated just behind the neck of the bladder, a little to patient's right side. It was quite immovable, a small calculous surface was exposed, surrounded by mucous membrane, and a mass of considerable size was clearly outside the cavity of the bladder. Placing the other index-finger in the rectum, I encountered a hard tumour, corresponding to that felt in the bladder, and movable between the fingers of each hand. It was evident that the mass consisted of an encysted calculus, as large as a walnut, and a small portion of its surface only was exposed in the bladder. Upon this, large phosphatic crusts had formed, become detached, and produced calculi in the interior. I made some attempts to remove the encysted stone, but ineffectually, for it was too deeply embedded to be displaced, except by unjustifiable violence, and I was compelled to be content with emptying the cavity of the bladder.

---

* Trans. Path. Soc., vol. xii. p. 136. I exhibited a case of my own also (post mortem); see vol. xii. p. 138.

† Trans. Path. Soc., vol. xiii.

The patient did very well for a few weeks. His condition was explained to himself and his friends, and I declined to recommend any further operation, having satisfied myself at the first, that it was impossible to do more. He was aged and feeble, and sank in about a month. At the autopsy the condition described was discovered, and I possess now the soft parts, showing the sac filled by a uric acid stone of the size described. No doubt, this is one of the few examples which I have had the opportunity of observing, of a stone becoming deposited in a sacculus in the bladder, where it has remained, increasing in size by constant deposit, until it completely fills the cavity.

The rarity of such occurrences is, however, demonstrated from the fact that few operators meet with more than one or two cases in a lifetime. Deschamps and Brodie each record but one case.

Sometimes a little embarrassment is occasioned to the surgeon by his discovery that the calculus is more superficially placed in the perineum than he expected; on his encountering it, in fact, before arriving at the bladder. A vesical calculus may be found occupying partly the bladder and partly the prostatic urethra; or two or more independent calculi, locked together, may be thus placed. It is necessary, of course, to remove that which first presents, after which there is usually not much difficulty in entering the bladder, and extracting the rest. Mr. Fergusson exhibited an example of this kind at the Pathological Society. Examples exist also in the Museum of the Royal College of Surgeons, in preparations Nos. 2026, 2027, and 2039. A large stone may even escape from the cavity of the bladder into the sac of an abscess in its walls, which has recently burst: a very remarkable example of this rare condition is seen, No. 2029.

Spasmodic contraction of the bladder, rendering the removal of the stone difficult, is described by some high authorities. It is regarded as something distinct from the condition which is present when the bladder has been merely emptied of urine, and therefore somewhat closely surrounds the stone. South, Brodie, and Gross speak of it, the two former recording cases in which it has been met with. Great care in the efforts made to extract, avoiding violence either with the scoop or forceps, and even waiting a little, are necessary in such cases. True spasmodic contraction of this kind is probably extremely rare, and when present it is not unlikely that chloroform may overcome it. When the bladder has become preternaturally small, and its coats are habitually applied closely to a large stone, there is sometimes great difficulty in removing it. The forceps must be manipulated with great care, and an additional hold with a well-curved scoop passed between the bladder and the stone, and beyond the latter, aids materially in dislodging it.

Sometimes the stone is lodged in the upper part of the bladder behind the pubic symphysis. Possibly this may be due sometimes to the spasmodic contraction just alluded to, but more generally, I believe, its position there is to be attributed to peculiarity in the form of the viscus, caused by hypertrophic thickening of the coats. The stone is habitually lodged there, and the vesical walls become thickened, partly by the process referred to, and in part from inflammatory deposit into their structure, impairing their power to dilate or contract.* Here pressure above the pubes, firmly maintained by an assistant, will enable the operator to dislodge the stone.

It is not very uncommon to hear of operations for the removal of calculus, in which it is said that the stone was adherent to the bladder. But it is quite certain that evidence resting solely on the sensations of the operator while in the act of removing the stone cannot be regarded as of much weight, since many conditions may occasion difficulty in its removal, erroneously suggesting to the mind the existence of some organic connection between the bladder and the foreign body. It may be said that a kind of organic connection between the inner coat of the bladder and a stone has been observed in the subject, but the phenomenon is excessively rare. A few trustworthy examples are appended in a note below, two of them have been examined by myself.*

---

* Excellent examples of this condition may be seen in the Museum of the Royal College of Surgeons. The preparation No. 2016, for example, is that of a bladder divided into an upper and lower cavity by a partial contraction in the middle; the upper portion was filled by a calculus, which it would have been next to impossible to extract by Perineal Lithotomy.

The mucous membrane of the bladder is, although very rarely, found to be coated with a layer of adhering calculous matter, and this is one of the forms of "adherent calculus" that anatomical researches have produced. In the Museum of the Royal College of Surgeons is the preparation of a bladder (No. 2024), the mucous membrane of which is studded with small calculi, partially embedded in minute sacculi, but between the calculi the mucous membrane is covered with a thin layer of calculous material; at least half the inner surface is thus coated. This condition would be a very embarrassing one in any operation. No. 2025 exhibits a similar appearance, only much less marked in degree. In No. 2023, the prostate has an enlarged median lobe, which is similarly coated: several small sacculated stones co-exist. The following case occurred to Mr. Wormald at St. Bartholomew's Hospital. A lad aged 19, was admitted with symptoms of stone. When sounded, calculous matter was felt with the end of the sound in every direction. The circumstances of the patient were regarded as unfavourable to operation, and he died in a few weeks. At the post-mortem examination a thick crust of concretion concealed the entire mucous membrane of the bladder, and could be peeled off in flakes. The kidneys were the seat of tubercular deposit.*

---

* A case met with in the dissecting-room of the Middlesex Hospital. A man aged 60 years had three calculi in his bladder, two being adherent; fibres of submucous tissue being incorporated with the calcareous substance. They were carefully dissected by Mr. Nunn. See Trans. of the Path. Soc., vol. vi. page 250.

A smaller calculus, similarly adhering, was found at the Middlesex Hospital by Dr. Vander Byl, in the body of a woman aged 50. Trans. of the Path. Soc., vol. ix. p. 296.

A very large calculus was found adhering to the upper part of the bladder by Mr. M. Henry, at an operation for Lithotomy. The stone was carefully examined afterwards, and a layer of closely adhering membrane of recent formation was found attached to one of its ends. *Idem*, p. 342.

There are several accidental circumstances occasionally met with in Lithotomy, which, not exposing the patient's life to risk, cannot be comprised in a discussion on the difficulties and dangers of the operation; but which are, nevertheless, productive of great annoyance, and even of misery, to those who are, unfortunately, the subjects of them. These will be enumerated here as accidents concurrent and consecutive.

Taking them in the order of their occurrence:—

1. The first accident which may be met with is that of wounding the rectum. It may occur if the incision is placed too low down in the region, as only just above the anus, especially if the knife is entered close to the raphè, from which, in this situation, it ought to be from three to four eighths of an inch distant. Otherwise it will not happen, if the knife be held with a moderate degree of obliquity, and proper care be taken to guard the position with the left hand, unless the bowel is unusually capacious, as in some elderly subjects; or is distended with fœces, as may happen when the preliminary purge or enema has not acted before the patient is placed on the table. The accident may take place in the first, or in the second incision, or while withdrawing the knife, if the operator enlarges the opening in that act. In any case, however, when an incision into the bowel has been made, and it is only small, no notice need be taken of it; if it is considerable, most authorities have advised that the opening should be

---

* This case was recorded in Med. Times, Nov. 19, 1859.

freely enlarged through the margin of the bowel and sphincter. But the necessity for this proceeding is by no means proved. Probably, the best method is to leave the parts untouched, and to reserve division of the sphincter until the necessity of it appears from the non-cicatrization of the wound, as such cases have been known to recover soundly when not interfered with.* At worst, usually, a small urethro-rectal fistula remains, which may be much diminished, or even wholly obliterated, by the introduction of a wire heated by the galvanic current, the bladder being first emptied and a vaginal duckbill speculum placed in the rectum.

2. The removal of a portion of the prostate gland by laceration, or otherwise, is not a very uncommon accident with elderly patients. It may occur in two very different ways: first, it sometimes, but rarely, happens that the section of the prostate divides, or exposes freely, one of those small rounded tumours which so frequently exist embedded in the substance of the organ, especially in elderly patients; under which circumstances the tumour becomes very easily enucleated. Secondly, when an outgrowth, more or less projecting or pedunculated, exists at the neck of the bladder, springing from the prostate into the vesical cavity, it is apt to be caught between the blades of the forceps when seizing the stone, and to be torn off in the act of removing it. I have myself witnessed this accident three times, and twice have removed such a

---

* Mr. South states that he has seen only two cases of wound in the rectum, both of which healed well without any incision.—Chelius' Surgery, vol. ii. p. 606, Lond., 1847. Samuel Cooper says he saw it "in three or four cases, but no serious consequences were the result."—Surg. Dict., 7th ed., p. 935. Mr. Key only once witnessed this accident, and no bad result occurred. Dr. Gross gives a decided opinion against interference.—Urinary Organs, 2nd ed., p. 590.

tumour myself, and in no one of the cases did it appear to endanger life.* Dr. Keith informs me that he has met with it nine or ten times, and he is not aware that material injury resulted in any instance. Mr. Key made a similar observation.† Civiale states that he has frequently removed them thus.‡ Nevertheless, it appears to have sometimes prolonged the recovery by retarding the healing of the wound. On the other hand, the patient has been known to pass urine more freely than before, but whether this has been due entirely to the removal of the stone, or whether in part also to the loss of an obstruction, it is not possible to decide. However, there can be no doubt that the accidental removal of these growths should be avoided, and with this object the left index-finger, when exploring the bladder, and subsequently when acting as guide to the forceps, or adjusting the position of the stone, should ascertain also, if possible, the presence of prostatic growth, and guard it from inclusion or laceration, when the operator is dealing with a patient of advanced age. If, when such a growth exists, he determines to get rid of it, as is sometimes done, it is better to do so with probe-pointed scissors than by tearing it off, or even than by excising it with the scalpel.

3. It is sometimes discovered within a few days after the operation, that one or more calculi, or fragments of calculus, remain unextracted. This is a serious accident and ought very rarely to happen, although, from unavoidable cir-

---

* I had the opportunity of exhibiting for my friend Mr. Cadge, of Norwich, at the Pathological Society of London, three tumours of this kind, weighing five scruples, removed from a patient the subject of two large stones, who recovered. —Path. Trans., vol. xiii. p. 155.

† "Remarks on the Lateral Operation of Lithotomy."—Guy's Hospital Reports, 1837, p. 23.

‡ La Lithotritie et la Taille. Paris, 1870, p. 455.

cumstances, it may occur to the most experienced operators. The course to be adopted must depend, in some measure, on the condition of the patient. When only small fragments are present, they will frequently pass spontaneously by the wound. If otherwise, and the patient is in course of recovery, and his prospects are good, the first step is to ascertain precisely the size of the fragment or calculus remaining. This may be done by a lithotrite, or measuring sound, passed through the urethra. If the calculus is found to be one of medium, or inclining to large size, it will probably be wise to place the patient again on the table, dilate the wound, and remove the foreign body with the forceps: if inclining to small size, it may be crushed through the urethra. On the other hand, if the patient is not in a promising condition, he must be left for the present, unless the presence of the calculus is manifestly occasioning so much distress as to render it probable that his improvement may be rather facilitated than diminished by interference for its removal. Calculous incrustation, always phosphatic, and coating the wound after lithotomy, is sometimes very troublesome. It occurs between the seventh and fourteenth day after, or thereabout. When slight, a few hip-baths, or washing with warm or acidulated water, will remove it. Once or twice I have found it so thick and so extensively deposited, as to be obliged to remove it by the forceps. In one case only it coated the whole track of the wound, from the perineum to the neck of the bladder, and from the internal extremity a small calculus was formed in the bladder itself, and was crushed by me before the end of the fourth week. The wound was some months in healing, but did so at last, and the patient is at this moment in excellent health.

4. Secondary hæmorrhage. Hæmorrhage occurring at, or immediately after, the operation, is an accident liable to occasion considerable hazard; it has, therefore, been considered in describing the steps of Lateral Lithotomy (see pages 43–7). But it is sometimes secondary, taking place at a period of seven to ten, or even fifteen days after the event, and then it must be regarded as an accident which no foresight could have prevented. Four cases have occurred in my own practice, in two with a fatal result, and in circumstances which, had it not happened, there was every reason to expect a successful issue to the case. One will be found in the appendix: Cases of Medio-bilateral Lithotomy, No. 8. The other occurred in a gentleman aged 55, quite suddenly and unexpectedly, on the twelfth day after a lateral operation.

The remedies must depend on the character and continuance of the flow. If controllable by the ligature, no means is so safe and certain; but at this stage such a result is not to be expected, since the external wound has generally by this time become small. The finger should be introduced, to ascertain whether by pressure with its point the source of bleeding can be stopped; if so, a piece of lint attached to a probe, or stick, and dipped in a solution of the perchloride of iron should be applied to the spot. Sometimes the actual cautery has been found effectual. At the same time local cold applications should be made to the perineum and adjacent region. Mr. South records several of these cases in which pressure with the finger on the pudic artery for several hours was necessary in order to save life.

5. Occasionally the wound which follows the operation heals very slowly, and results in the persistence of a

fistulous track from the prostatic urethra to the perineum. This is an exceptional, yet not a very uncommon, occurrence. Most operators number in their experience a certain small proportion of such cases. The fistulous opening depends sometimes on the deposit of phosphatic matter on the raw surfaces of the wound from the urine; a condition already referred to. The deposit may become permanent at the upper extremity of the passage; in other words, may form a calculus there, which, until removed, will assuredly maintain the patency of the fistula. If, then, we have ascertained that no such foreign matter exists in the track, the whole internal surface of the fistula should be lightly touched with the actual cautery in the form of a heated wire, or with the galvanic cautery, or with a probe coated with nitrate of silver. After this the patient, having previously learned to do it with facility, should withdraw all his water on every occasion for three or four weeks by catheter, provided he can accomplish it easily, so as to prevent any flow through the fistulous channel. By a perseverance in this plan success may be obtained in several, perhaps in most, cases. It has been recommended to allow a catheter to remain in the urethra and bladder for some days, with the view of withdrawing all the urine in this manner. But this mode of treatment is not successful. Urine soon trickles by the side of the instrument and so enters the fistula; and the urethra itself becomes irritated, and much purulent discharge is secreted from its mucous membrane, conditions very unfavourable to the healing of any fistula. On these grounds, and from the observation of its effect in numerous cases of urethral fistula, I very much prefer the employment of the catheter by the patient on each occasion of his requiring to pass water. There are still a few cases met with, which it must be confessed appear to be wholly intractable, and these for the most part probably owe their character to the existence of disease in the prostate gland.

6. A result of the lateral operation, which very seldom occurs, is sexual impotence. This condition has been attributed to the division of the seminal duct which lies nearest to the line of incision. There is good reason, I think, to doubt the correctness of this supposition. First, the line of incision ought never to intersect the duct even on the side operated on; the knife must be carried almost vertically downward in order to endanger it; indeed, if it be employed with even a less degree of obliquity than has been previously advised, the vessel will still be safe. Secondly, the duct of the other side must in any case remain intact, for it is difficult to conceive the possibility of an operator dividing both; and if one is left uninjured it will be superfluous to state that sexual impotence following the operation is not the result of the surgeon's knife. The real cause of this happily exceedingly rare sequence to the operation is rather to be sought in some morbid change affecting both the seminal ducts, and which may be produced by the lesion of Lithotomy as it now and then is by other lesions. When prostatitis has terminated in chronic prostatic abscess (I do not refer to periprostatic, so often mistaken for it), and this has involved in destruction all, or nearly all, the structure of the gland, the ducts sometimes become obliterated or sealed by plastic effusion, and loss of sexual function results. The vesiculæ seminales may then be found exhibiting the same condition, having become the seat of abscess, their structures being injured or atrophied. This condition I have seen, not only fol-

lowing abscess, but also as the result of tubercle in the prostate and vesiculæ. When, therefore, loss of virile power follows Lateral Lithotomy, I believe it is generally due either to sloughing from violence, or to inflammatory action in and around the ducts and vesiculæ seminales, destroying the function of these organs as conduits for spermatic fluid; and not to the mechanical division of one or both of them by the knife. The fact is an extremely difficult one to verify: long-continued and patient watchfulness for the opportunity of dissecting cases can alone determine precisely the actual lesion which has destroyed the function in question.

7. Incontinence of urine occasionally follows the operation. It occurs more frequently in patients below the age of puberty than in adults. Apart from those rare instances of extremely large stone in which the neck of the bladder has been extensively damaged, no very clear explanation of the cause can be afforded, although speculative statements respecting it have been frequently made. Nor, perhaps, is it possible to offer any therapeutical considerations relative to it, differing from those which are available for incontinence occurring in ordinary cases, the numerous and varied modes of dealing with which need not be recapitulated here; the following fact, however, is worth notice:—A very successful case of Lateral Lithotomy for large stone, which I performed in 1869, was followed by this unpleasant consequence for many months. The patient was otherwise in perfect health. Scarcely venturing to hope for good result, I cauterized the neck of the bladder in the summer of the present year, 1870, since which there has been almost no incontinence. The effect was as complete as it was unexpected.

8. A very unfortunate accident remains to be noticed, which is occasionally, but by no means frequently, encountered: viz. inability to discover any stone in the bladder when the operation has been performed.

In the first place, the stone may not be found because it is so small as to be washed out with the first gush of urine from the bladder. I have seen Lithotomy performed for a stone no larger than an apple-pip, and no small embarrassment arising in consequence of the occurrence named. It has happened, not very unfrequently, that after a long and fruitless search in the bladder, a very small concretion has been found on the floor, or in the receptacle placed to receive the blood and urine, or embedded in a clot, or even adhering to some part of the operator's dress. But this ought not to happen, mainly because cases in which the calculus is so minute should not be subjected, as a rule, to Lithotomy at all. We shall see hereafter in the final application, in Chapter XIV., how necessary it is, before performing any operation, to ascertain the size of the stone, that we may select an operation which is adapted to it.

Again, an operation may prove fruitless because the stone is fixed in a cyst of the bladder, and cannot be detached from its place. This is very rare; because if the presence of a stone can clearly be verified by means of the sound, it is generally sufficiently free in the bladder, although it may be partially encysted, to be removed by some means. See the management of encysted calculi at page 118. More rarely still are the following conditions met with. A bladder is sacculated, and one of its sacs is large, and communicates by a considerable opening with the original cavity. The latter state is rare, such openings being almost always small. But the patient is also the subject of calculus. The stone is usually in the bladder proper, where it is readily struck by the sound, but occasionally escapes into the sac, where there is no possibility of reaching it. Here, as in the preceding case, if its presence cannot be made out satisfactorily with the sound at the time of operation no incision should be made.* Lastly, no stone may be found at the operation, because none has ever existed. The surgeon may have repeatedly sounded his patient, may have satisfied himself and others that he is the subject of calculus, and yet no stone whatever may have been present. Thus, the existence of a polypoid tumour in the bladder, probably with some calculous deposit adhering to its surface, has deceived the surgeon. Such a case was many years ago cut for stone; the preparation is now in the Museum of St. Thomas's Hospital.†

Again, it has happened that a rugose and hardened condition of the muscular fibres of a hypertrophied bladder has misled the surgeon, when sounding, into the belief that he has struck a stone. Still, nothing like the clear and ringing sound of a calculus can be elicited from such a source. The bony walls of the pelvis particularly, according to some authorities, may furnish similarly erroneous impressions to the operator. But in both these circumstances, the tactile impression and the audible sound are dull and heavy, not so clear and defined as the metallic click of a stone. Yet the fact exists that highly experienced and able surgeons have been misled by one or other of these causes.* Few have the courage and the honour to enlighten their brethren by publication of the case after an experience of this kind. Mr. Paget, of Leicester, has very recently offered a noble exception to this remark, in furnishing the particulars of an instance in which he operated without discovering stone. In his case, that of a child, the click, although heard by several, was not satisfactorily distinct on any of the occasions of sounding which had taken place, while the symptoms were exceedingly severe. The operator, however, desired to relieve the sufferer if it were possible, hoping that a partially encysted stone might be the cause. Death occurred after two days, and at the post-mortem examination no calculous matter was found in the bladder, but the ureters were enormously dilated. On repeating the act of sounding, the click was reproduced, and it was discovered to be due to the point of the sound impinging upon the iliac portion of the brim of the pelvis, the edge of which was unusually thin and sharp.† This case, in some measure, confirms the opinion of Mr. Gutteridge, of Birmingham, who had, with a like admirable candour, previously published the fact that he had "operated in three cases, wherein the most confident assurance the sense of touch was capable of giving was had respecting the existence of a stone," and had, nevertheless, found none. The patients lived, but by subsequent inquiry and experiment on the dead body, Mr. Gutteridge came to the conclusion that the deception is due to the sound striking some part of "the bony fabric of the pelvis itself;" and he defines the precise spot to be the spine of the ischium, a part rarely touched, except when, the suspected stone not being at first found, a prolonged and extended search is made; and he adds, "the sound or staff being brought to the ischiatic ring, on either the right or the left side, and kept pressed there, will procure a sensation like that caused by touching a large rough stone."*

---

* It may be as well to say that there is a material distinction between the terms "cyst" and "sac" as used here. By cyst I mean a cavity in the walls of the bladder, fitting to, and embracing closely, the stone which is always lodged in it: by sac, one of those large dilatations of one or more of the vesical coats, found independently of stone, but in which one may sometimes be lodged.

† South's Chelius, vol. ii. p. 551.

---

* Cheselden, Roux, Dupuytren, and Crosse have operated and failed to find the stone.

† British Med. Journal, Dec. 14, 1861.

After experience and statements like these it may appear somewhat hardy to say that I am unwilling to relinquish my belief in the possibility of distinguishing between the click of a stone, and a sound produced in the manner described. I have repeated the experiment on the dead body several times, and I am quite unable to elicit a note, or to perceive a resistance by striking the sound against any portion of the bony walls of the pelvis, which is at all comparable with the results obtained by striking any kind of vesical calculus I have ever encountered in the bladder. The question is one of great interest, and is well worthy of further examination. Undoubtedly a certain very small number of patients who are not the subjects of calculus, have been submitted to the incisions of Lithotomy, under the impression that they were so. But I believe that this happens less frequently now than in former times. As the art of diagnosis becomes more cultivated, and the means of exercising it are improved, the number of these cases will be diminished. With our present means and knowledge, I venture to believe the mistake ought not to occur.

---

* A Memoir on the subject, published by Mr. Gutteridge, Sept. 1860.

CHAPTER VII.

THE RESULTS OF LITHOTOMY.

My own Inquiry, embracing 1827 Cases.—Complete Analyses of them.—Affords a True Result of Lateral Method before Lithotrity was general.—Results now will be wholly different.—Will Vary according to the Proportion of Patients selected for each Operation.—Results of other Forms of Lithotomy.

AN inquiry into the results of Lithotomy, will in the future be a different pursuit from that which it has been in the past, and will yield different conclusions from those which have hitherto been attained by it. It is a much less easy and less simple thing to estimate its real capabilities now than formerly; for when the Lateral Operation alone was applied to all the patients with stone, its results were calculable by enumerating the cases, their ages, and the ultimate fact, whether recovery or death.

Several years ago I made a laborious and extended inquiry relative to that operation in this country; and it is a matter of no little satisfaction that the matter was accomplished then, as the opportunity will probably never recur. The crushing operation has been found too successful for a return to Lateral Lithotomy as the invariable and only resource for calculous patients, as it was in old time. Before Lithotrity had become at all general in Great Britain, I had the means of ascertaining the capabilities of Cheselden's method, in those districts where it was still the invariable practice; and I think I am entitled to say, by adopting a more rigid system of inquiry than had ever been pursued before, I obtained nearly 2,000 cases of perfectly authenticated examples in the following manner, rejecting a large number of available data, because they were unaccompanied by all the facts which I considered necessary, or had occurred in circumstances which appeared to impair their value as evidence.

I required the whole of the hospital experience of a district, a written note of every patient, including his age and the result of the operation, and during a long term of years, corresponding with which the Lateral Operation alone should have been employed. On account of imperfect records, many hundreds of cases were rejected, since well ascertained facts alone could be serviceable. Thus, also, in many reports which I received, the operators selected their best cases for Lithotrity, others for the Median Operation; on this account I did not include Mr. Teale's valuable and well-known experience. Others again, and this will apply also to the gentleman just named, were men of so great celebrity in their districts, that the worst and oldest examples of the complaint were attracted from afar, and contributed to make such an experience by no means a fair and average product of the neighbourhood. I was therefore compelled to exclude Mr. Crichton's long and valuable list in my possession, because it contained a most unusual proportion of aged patients. But the most considerable sacrifice of this kind which I have made is the exclusion of Dr. Keith's large and admirable experience, and on the same ground.

The experience of the Glasgow Infirmary, numbering 152 cases, is not employed in this department of the inquiry, because a large proportion had been operated on by the method of Dr. Buchanan. So, also, that of the Bristol Royal Infirmary, kindly afforded me by Mr. Pritchard, simply because it was not possible to ascertain correctly the ages of all the patients submitted to operation. The same remark applies to some of the metropolitan hospitals, to which access has been kindly afforded.

Such care is essentially necessary in order to obtain valid numerical results. My table, then, is composed as follows :—

The experience of the Norfolk and Norwich Hospital, including the 669 cases published by Mr. Crosse, in his well-known and valuable work, and 124 more cases immediately following these, during a subsequent period, and not interfered with by other modes of practice. For these I am indebted to my friend, Mr. Cadge, of Norwich.

The records of the Radcliffe Infirmary, Oxford, up to the present time, for which I am indebted to Mr. E. L. Hussey, of Oxford. The entire experience of University College Hospital, London, from an early date until very recently, for which my best thanks are due to each and all of my esteemed colleagues.

A detailed account of all the cases met with at the Leicester Infirmary, obtained for me by my friend Mr. Thomas Paget. The experience of the Leeds Infirmary, for which I was indebted to my friend, the late Mr. Nunneley. That of the Birmingham General Hospital for the last ten years, kindly placed at my disposal by Mr. O. Pemberton. The records of Guy's Hospital, carefully prepared by Mr. Thomas Bryant, who most readily permitted me to make any use whatever of them. The experience of the surgeons of Saint Thomas's Hospital, for which my thanks are due to Mr. Solly, Mr. Le Gros Clark, and for valuable aid in my inquiries to my friend Dr. Bristowe.[*]

I am also a debtor for much kindness and pains to Dr. George Murray Humphry, of Cambridge, in affording me the experience at Addenbrooke's Hospital; an additional number of 183, including 13 deaths, a result which is so much better than any other, viz. one in 13 cases, that I am compelled to mention and register it separately as well as collectively. Once for all, let me say that, respecting every one of these cases, I have received, and now possess, exact particulars in writing from the most competent person to furnish it: those cases only excepted which have been referred to as already published by Crosse and South.

The sum total, with Cambridge, is 1827 cases of Lateral Lithotomy, including 229 deaths, or one in 7·977, almost exactly one in 8. Without Cambridge it is 1644 cases, with 216 deaths, or one in 7·62, in round numbers 7½.

The separate results are as follows:—

Norwich (Crosse) . .	669	cases, with	91	deaths, about	1 in 7⅓	cases.
Since that time .	124	,,	15	,,	1 in 8¼	,,
Oxford	110	,,	14	,,	1 in 8	,,
Leicester	90	,,	8	,,	1 in 11	,,
Leeds	29	,,	4	,,	1 in 7¼	,,
Birmingham	102	,,	10	,,	1 in 10	,,
Guy's Hospital . .	230	,,	33	,,	1 in 7	,,
St. Thomas's do. . .	200	,,	29	,,	1 in 7	,,
University Coll. do. .	90	,,	12	,,	1 in 7½	,,
	1644		216			
Cambridge	183	,,	13	,,	1 in 14	,,
	1827		229			

It must be remembered that these ratios of death alone furnish no certain index of the success which has followed the operation at different institutions. Before all things, indeed, it is necessary to know also the relative proportions of young and aged patients included in the number, since the rate of mortality differs so greatly at the different extremes of life, an element so constantly lost sight of in discussing the mortality following Lithotomy. Taking the whole number of 1827 cases, no less than half of them occurred in patients under the age of thirteen years. Applying this rule to any of the separate reports, we have an easy and tolerably accurate mode of testing the relative proportions in question. In metropolitan hospitals, to which many patients from the country are sent up, these being almost always adults, the proportion of aged patients is larger than that in the provincial hospitals. Thus in the records of University College Hospital, instead of half the number of patients being below thirteen years, those below that age formed only two-fifths of the total, from the unusually large proportion of elderly cases. In the Norwich Hospital the proportion of adults is also larger than the average, while that of Cambridge has a little more than the common proportion of children. The metropolitan hospital of Guy's has, however, also an unusually large proportion of young cases.

---

[*] A portion of the St. Thomas's cases are the more recent ones (those in which all particulars were present), belonging to the well-known Table published by Mr. South, in his edition of Chelius' Surgery, vol. ii. p. 635.

But for any such inquiry it is necessary to deal with the question of age much more carefully and minutely. We have to examine the proportion of fatal cases after the lateral operation as occurring at *several different periods* of life. And I have dealt with this subject in a manner somewhat differing from that usually pursued. Thus it was soon obvious, in studying my figures, that little was to be gained by adopting the usual method of classifying the results of operation during periods of life artificially fixed, as from 1 to 10 years, 10 to 20, 20 to 30, and so on, the product of which is extremely deceptive. It was necessary to examine every year separately, then to group the years, and to observe what natural indications the facts presented. The following plan, after many trials, appeared to me best adapted to afford the simplest and truest aspect of the subject at a single glance.

During the years	Cases.		Deaths.			
1 to 5, inclusive.	473,	including	33,	or	1 in 14⅓	cases.
6 to 11, inclusive.	377,	,,	16,	about	1 in 23½	,,
12 to 16, inclusive.	178,	,,	19,	,,	1 in 9½	,,
17 to 20, inclusive.	76,	,,	11,	,,	1 in 7	,,
21 to 29, inclusive.	86,	,,	11,	,,	1 in 8	,,
30 to 38, inclusive.	75,	,,	7,	,,	1 in 10½	,,
39 to 48, inclusive.	100,	,,	17,	,,	1 in 6	,,
49 to 58, inclusive.	191,	,,	40,	,,	1 in 4¾	,,
59 to 70, inclusive.	233,	,,	63,	,,	1 in 3¾	,,
71 to 81, inclusive.	38,	,,	12,	,,	1 in 3⅙	,,
	1827		229			

In studying this table, we see what Lateral Lithotomy is capable of effecting at various ages. At the earliest ages—the first year only excepted—one death occurs in about fourteen cases, the rate of mortality falling to one only in twenty-three cases between six and eleven years. As we pass from twelve to sixteen years, the death-rate rises, for during the period when puberty is declaring itself, as sexual activity becomes developed, we find the increased susceptibilities thus aroused, raising the mortality to one in nine and a half; and, from thence to the twentieth year, to one in seven cases. It improves but slightly up to the thirtieth year, being until then about one in eight cases. As manhood becomes established and the strength increases, the death-rate diminishes to one in ten and a half between the thirtieth and the thirty-eighth year. But during the succeeding ten years, organic morbid changes beginning to set in, and the influence of continued depraved habits to tell on the constitution, the rate rises to one in six. These causes become more active, and at the same time the powers of life diminish, as age progresses from fifty to seventy years, the rate rising to one in four and three-quarters between forty-eight and fifty-eight, and gradually to one in three and three-quarters between fifty-eight and seventy, and finally to one in little more than three between seventy and eighty.

Now let us revert to the two great groups, separated from each other by the event of puberty. The great group of infancy and boyhood, ceasing as adolescence begins, say at sixteen years, and comprising more than half the entire number, were operated on with a mortality of one in 15½ cases. Subtracting all these, we shall now learn its product in relation to adults. Regarding this great group as composed of all ages above 16 years, and it matters little to the result whether we commence at that age or at 20 years, we find just 800 individuals left. Among these were 161 deaths, giving a mean of rather more than one death to every 5 cases. This, indeed, there can be no question, is a good average result of the operation as applied to average adult males only, eliminating the disturbing influence of the large number of cases under puberty; and it may be said here that this is the total to which the results of Lithotrity are to be brought, for purposes of comparison, since that operation is applicable to adults alone.

I have already said that we can no longer examine Lithotomy under the conditions of the past. At the present time, almost all the cases of small stone, and those occurring among the healthy patients, at all events, are submitted to Lithotrity. For some past time, and in the future, Lithotomy in adults must be regarded as an operation almost exclusively applicable to unusually large stones, and often to patients in bad health. Instead of looking for one death in four or five cases, which I have shown to be a good result among average adults, we shall find a much larger proportion of fatal consequences. This again will be modified by the habit of the operator, in selecting patients for the two methods. If he divides his cases pretty equally between the two operations, Lithotomy and Lithotrity, he will have a much smaller proportion of deaths from Lithotomy, than if he applies the crushing operation to four cases out of five. If he takes this latter proportion, he will have made Lithotrity responsible for some difficult and unhealthy cases, but four out of five will have escaped the knife. His Lithotomy will in this case be performed on *selected bad cases*, and the mortality will necessarily be high. His Lithotrity will have a higher death rate *per cent.*, but the very strong probability is that there will be a smaller percentage of deaths on the *sum total of his stone cases*. Thus it is clear that the mode of selecting, and the ratio of apportioning, patients for the two operations, must be known before the results can be exactly judged. Some important facts relative to this question were supplied by Sir William Fergusson's valuable lectures at the Royal College of Surgeons in 1865, embodying, as they did, his entire practice in Lithotomy and Lithotrity up to that date. In all ways he had treated 271 cases of stone, of which 52 were children. Subtracting these, Sir William gives his experience on 219 adults. They were equally divided between the cutting and the crushing operation, that is, 110 by Lithotomy, and 109 by Lithotrity. Of the 110 adult lithotomies, 33 died, or one death in every 3⅓ cases. Of the 109 adult lithotrities, 12 died, or one death in every 9 cases. No doubt Sir William would now select a larger proportion for Lithotrity, as these figures include his early cases, before that operation was so much in vogue, and when almost all were submitted to the knife.

So also with Dr. Keith of Aberdeen, who most kindly placed at my disposal complete notes of all his cases up to 1863, 300 in number, the product of the previous twenty-five years of practice. His cases of Lithotomy much more than equal in number those of Lithotrity, and exhibit, therefore, fewer deaths per cent., the cream only being reserved for Lithotrity. Of these, 24 cases were those of women and children, leaving 276 adult males. Of 160 adult lithotomies, 38 died, or one death in every 4⅕ cases. His lithotrities in adults were 116 in number, with 7 deaths, or one death in every 16½ cases. As is the case with all surgeons of large reputation, these lists include a considerable proportion of elderly and infirm cases.

But in order to determine something like what should be the relative proportion of patients to be submitted to the knife and to the crushing operation respectively, we must still look to the future. We are only beginning to appreciate the extent to which Lithotrity is capable of being applied. Thus, while the figures above show—and, doubtless, from the cause already mentioned—in one case, an equal number submitted to each operation, and, in the other case, that three-fifths were cut, while only about two-fifths were crushed, I have at present applied Lithotrity *to five out of every six cases* of adult patients who have applied to me. With the total results I have ample reason to be satisfied, but I am by no means clear that any one can, at present, determine a rule which shall be even approximative as to the proportion which will give the best product. Neither can we, until a few years more of experience and of study of this matter, say what mortality from Lithotomy may be expected from a course so novel as its limitation to this small minority of calculous cases, these being the selected few who are so diseased, or are subjects of such large stones, that Lithotrity is absolutely incapable of dealing with them.

The solution of this problem, so far as it is possible, may be hoped for at no distant period. A very few years more will afford us several hundred cases treated in the relative proportions just named.

Strongly encouraged by the experience of the past to pursue the course indicated, I have no doubt of being able before long to afford data ample enough to indicate some guidance in this complicated question. My plan has long been traced, and no deviation will be made from the standard of numbers which I consider requisite in order to deduce an accurate result. This, and nothing short of this, being the object of my labours.

A few words may follow here respecting the mortality following other forms of Lithotomy.

To Mr. Allarton I am indebted for the record of 139 cases of Median Lithotomy at all ages, with 13 deaths, or one in 11 cases. Not to forestall future observations, it is necessary to note that this operation, being usually reserved for stones known or believed not to be very large, we are entitled to claim from it a result better than that of Lateral Lithotomy. This does not include the Norwich cases of the Median Operation, which my friend Mr. Cadge informs me amount to between forty and fifty within the last three or four years, and the mortality from which has been about the same as by the lateral method. But it is only fair to state that there was rather a full proportion of unpromising cases among them.

Dr. Buchanan is able to report upwards of sixty cases of his operation, performed by several surgeons, with, as nearly as possible, the same result as that exhibited by Mr. Allarton's table.

From the history of the Bilateral Operation, we know that in the hands of Dupuytren and his contemporaries, 85 male cases were cut, with 19 deaths, or about one in 4½ cases. In other hands it is said to have been more successful.

Of the Medio-bilateral Operation we have no large experience to examine. I have performed it in a few cases, believing, at one time, that it might present some advantages over Lateral Lithotomy, but I do not find this to be the case, as far as I can judge. I used it as an exceptional proceeding for large stones not amenable to Lithotrity, and always in elderly and infirm men.

The remarkable result which my experience afforded me, and which I was not prepared for, was that the hæmorrhage was often unusually large and troublesome to repress. Besides this, the rectum was easily wounded from its necessarily close proximity to the incision, for a large stone, not always perhaps by the knife, but by the removal of the stone tearing the thin septum between the wound and the bowel. On these grounds I have discontinued the operation, having performed it last in January, 1868, and have substituted the Lateral Operation.

From the history of the Recto-vesical Operation, we learn that a nearly equal number of cases gave a result of about one death in five; and a similar proportion of the patients recovering were the subjects of fistula subsequently.

The Suprapubic Operation has given results said by some to be about one death in four cases. Dr. Murray Humphry, of Addenbrooke's Hospital, Cambridge, performed it successfully for a boy of fourteen years. He collected from authentic sources 104 cases, of which 31 were fatal, equal to one death in 3⅓ cases. Of course it is to be recollected that this, as well as the preceding operation, is rarely performed for other than very large stones, and mostly in adults. He remarks, also, that "the dangers of the high operation do not increase in so great a ratio with the size of the stone" as in the lateral operation.*

---

* Case of High Operation. Trans. Prov. Med. Ass. 1850. Vol. xvii. p. 103.

PART II.—LITHOTRITY.

CHAPTER VIII.

LITHOTRITY.—INTRODUCTORY.

General Observations relative to its Rise and Progress.—The Importance of Treatment Preliminary to the Operation.—Its Nature, General and Local.

I PROPOSE in this, the second portion of my work, to illustrate concisely the principles and practice of modern Lithotrity.

By this term, since custom has popularized it, all those processes may be denoted by which the stone is broken up, crushed, and powdered in the bladder, and by which the débris are removed through the natural canal of the urethra without the use of the knife.

Lithotrity is the product of rapid growth. Fifty years ago it was but a theory. Thirty-five years ago it had barely made good its claim to be admitted into the list of recognized surgical operations. Each succeeding ten years has witnessed great improvement in its applications, and its increased capabilities for good.

The Lithotrity of to-day is not the Lithotrity of even ten years ago, but a safer and a better operation. An

'ANE LIBRARY. STANFORD UNIVERSITY

operation which now is founded on principles, and regulated by well-defined laws deduced from a large experience; no longer consisting, as in its infancy, in the mere experimental application of a crushing instrument to any calculus which, being considered neither too hard nor too big, might be located in a fairly healthy bladder.

It is, therefore, the Lithotrity of to-day, its principles, and the practice logically deduced from them, which it will be my aim to expound and to illustrate here.

There is reason to believe that calculous matter has been occasionally removed by Lithotrity at various early dates, but no attempt seems to have been made to apply the principle, generally or systematically, until A.D. 1813, when Gruithuisen, a surgeon in Bavaria, proposed a plan for seizing and reducing to powder, by drilling, a stone in the bladder. Subsequently, in 1819, Elderton, a Scotch surgeon, published a somewhat similar proposal. Meantime, in 1817, Civiale, of Paris, designed his earliest instruments; and was closely followed by Leroy d'Etiolles and Amussat, in the production of other instruments for the same purpose. It appears, however, that the first successful operations were undertaken in 1824, the honour of which belongs to Civiale, who performed them before a committee of the French Academy. Improvements in the method and in the instruments were subsequently made by Weiss, Heurteloup, L'Estrange, Costello, Charrière, and others, as well as by Civiale himself, whose experience in the application of Lithotrity must be regarded as exceeding that of any other operator. It is his method which, during my earlier operations, was closely followed and practised by myself; my own experience, however, now very large, has led me to modify the character and action of the lithotrite, and the method, to a certain extent, has necessarily somewhat changed with it. I have no hesitation, after large opportunities of watching the practice of Civiale, as well as that of other operators, to present the operation now referred to as a more rapid and as a safer method than any previously practised. It is this, therefore, which I design to expound here, and this will be done in the next and succeeding chapters.

TREATMENT PRELIMINARY TO THE OPERATION OF LITHOTRITY.—There is one topic in connection with Lithotrity which I do not propose to consider at length here; the practical management of the operation itself being the main object in view. But it is impossible to pass it by altogether. I refer to the preparatory treatment which should precede, in some instances, the application of operative measures.

Among the calculous patients admitted into hospitals in the Metropolis, most show signs of general deterioration of the health; the result of pain, loss of rest, and other depressing influences of their malady. Much may often be done to improve their condition before deciding on, or proceeding to, the operation. Others, however, and especially some patients from country districts, present much more promising signs, even although they may have been for a considerable period the subjects of stone. Nevertheless, it is unwise to admit even these cases to operation after a rest of only three or four days, and the conventional aperient. It is an error, I believe, to operate on country patients, whether in private or in public practice, immediately after their arrival in London. However healthy the condition of such a case, it often happens, if operative proceedings are at once undertaken, that the patient soon afterwards becomes the subject of fever and exhaustion, and he may even fall a victim to the attack.

A period of acclimatization must be passed through by most of them, during which the system is not in a condition calculated to support favourably a capital operation. Soon after the arrival of a country patient in London, he frequently becomes feverish, digestion is deranged, and sleep disturbed. Generally, a dose or two of mild aperient, and more than ordinary care in diet, restore him quickly to his usual condition. Many persons, enjoying excellent health, always suffer in this way in a change from country to town residence. The change involves altered diet, altered habits, and the presence of numerous sources of excitement, disregarded by the native, perhaps unknown to him, but strongly impressing, and often disagreeably, the sensorium of the stranger. When to these are added the numerous sources of anxiety and discomfort which the subject of severe disease must additionally experience, and this at a moment when he is anticipating the crisis which he knows is to free him from it, but not without some risk to life, it is no matter of surprise that some nervous derangement should manifest itself in a variety of troublesome symptoms. It is this condition which I have often observed in the circumstances described, and lasting for a varying period, from three or four days to a fortnight, which should be surmounted, before any operative procedure is performed.

Apart from these considerations, but little reflection may suffice to convince us, that in all cases it is unwise to cut into, and still more so to crush in, the cavity of a bladder, which is the subject of unchecked chronic inflammation, as almost all bladders containing calculus are, in a greater or less degree. In such a condition, a very little interference will often set up acute cystitis, and from this source morbid action may invade the kidneys and prove rapidly fatal. Some remarks by my esteemed colleague, Mr. Erichsen, on the causes of death after Lithotomy, are exceedingly appropriate in this place. He says:—

"That the mere cutting into the bladder is not a very dangerous proceeding, provided that viscus and the kidneys are healthy, is evident from the fact that in those cases in which surgeons have had to extract bullets, bits of catheter, &c., from this organ, bad consequences have rarely occurred, though the operations have often been tedious; but in Lithotomy the case is different, for here the bladder is not only usually in a state of chronic irritation, but the kidneys are frequently diseased; and these conditions influence more materially the result of these operations than any other circumstances." *

The inference is obvious. By endeavouring, through every means in our power, to allay the irritation of the bladder, and to tranquillize the nervous system disturbed by local pains and broken rest, we do more to insure a successful result for the future operation than by any other course whatever. If we can accomplish these objects, although at the sacrifice of a little time, prior to operation, we have a right to expect, other things being ordinarily favourable, the ultimate recovery of the patient.

We shall enjoin, then, for a few days, rest in the recumbent posture; and, according to the necessities of the patient, attention to the secretions, regulated diet, local bathing, possibly, in some few cases, washing out the bladder; as well as anodynes and sedatives by mouth or rectum.

---

* Science and Art of Surgery. London. Third Edition, 1861, p. 1009.

Demulcent drinks, decoctions of roots and leaves exercising specific effects on the bladder, are also useful. Among them, I know none, in these particular circumstances, so valuable as a decoction of the underground stem of *Triticum repens;* a pint to be taken in divided doses daily.

One element of the preliminary treatment is the systematic employment of bougies, so as to accustom the urethra to the contact of a full-sized metallic instrument. Especially if the patient has not been the subject of catheterism previously, first a soft elastic bougie of middle size, and then metallic ones, may be passed through the urethra every other day or so, increasing the size on each occasion. Lastly, an ordinary sound, which much resembles the lithotrite in form, may be employed, and with it the stone may be found, and some conceptions obtained of its size and consistence. A little warm water may be injected into the bladder if much pus or mucus is present, and the urine is alkaline; or water containing a small proportion of nitric acid, or of acetate of lead, especially if phosphates are found in the deposit. If no irritation follows, but if on the contrary the urine becomes freer from sediment, and the patient retains his water longer than before, we have already achieved an important step in the progress of the case.

But this preparation by instrument is really necessary in only exceptional cases. When the urethra is not quite ample a bougie or two may be advantageous, but if they give rise to a feverish attack, some further care should be given to the patient before employing the lithotrite. In all instances, the use of one or two instruments indicates the existence or not of constitutions peculiarly susceptible to this kind of disturbance, and seasonably indicates cases in which further interference, at any rate, at present, will be injurious. When abscess, or purulent infection, or fatal fever, supervenes on the first sitting, as occasionally happens, it will be generally found that due preparation has been neglected. Had the result of instrumental applications, cautiously made in the manner described, been first ascertained in such a case, it is more than probable that grave consequences would have been avoided. It is this fact which gives importance to preliminary treatment.

We desire to have the following conditions present if possible. They are not necessary to the successful performance of Lithotrity, for results of a most valuable kind are happily often obtained in their absence. But they conduce greatly to success, and we therefore do our best to achieve them, or, in default, the nearest approach attainable.

1. A fairly capacious and not very tender urethra.
2. A bladder capable of containing 3 or 4 ounces of urine, not very irritable, yet possessing a moderate degree of tonicity, that is, capable of expelling its contents.
3. Fair general health.

CHAPTER IX.

THE OBJECTS OF LITHOTRITY, AND THE PRINCIPLES ON WHICH INSTRUMENTS SHOULD BE CONSTRUCTED IN ORDER TO ATTAIN THEM.

All evil Results arise from mechanical Lesion.—Lithotrites constructed so as to avoid this.—Lithotrites in two Classes: with Fenestrated Blades and Plain Blades.—Functions of the former and of the latter.—Mechanical Powers adopted: the Wheel and the Screw.—Lithotrites of different kinds.—Value of the cylindrical handle.

WHAT is the precise object of Lithotrity? is a question which must be proposed and definitely answered at the outset of any consideration of this subject. The object of Lithotrity is not merely to reduce a stone to fragments, although this is a necessary part of the operation; the ultimate end to be attained is *the reduction of the stone to powder or small débris:* such as, for the most part, can be voided by the patient without unusual or instrumental assistance: the making of fragments, therefore, is only one step in the proceeding.

It may be assumed as obvious that the principal evils arising in Lithotrity consist of, or are traceable to, direct mechanical lesion; in other words, inflammation of the bladder and urethra are in any case almost invariably caused by instrumental interference, or by the presence of sharp or angular fragments.

Therefore, although we cannot absolutely insure the realization of our endeavours, we should aim first at reducing the stone to a condition in which it will least injure the mucous membrane, and be most readily expelled from the bladder, viz. a state of granulation; and secondly, we should endeavour to effect this object by the smallest possible amount of instrumental interference.*

These two principles are to be constantly kept in view; they will guide us materially in the selection of instruments, and in numerous details connected with the operative treatment.

The subject of instruments will first engage our attention. The mode of applying them will follow: and here it may be well to remark that the practice of systematic, methodical Lithotrity—and such alone can be relied on for success—consists not only in the conformity of its proceedings to two or three general principles, but in attention to numerous details, the value of which experience has established. Each of these may be minute in itself, indeed, apparently insignificant at first sight to some minds; but each becomes important when the result of their aggregated influence is regarded. I feel, then, that no apology is due for the attempt to present a circumstantial exposition of these details, especially as I know of no published source where it can be found. Of one thing I am certain, they will not be deemed unimportant, or without value, by those who have a practical acquaintance with the difficulties and the risks which attend Lithotrity when pursued in ignorance of rules and without a method.

INSTRUMENTS FOR CRUSHING STONE IN THE CAVITY OF

---

* In the previous edition I have spoken of reducing the stone to "powder;" but the term now used, "granulation," expresses more accurately the mechanical condition I desire to produce.

THE BLADDER: LITHOTRITES.—The subject of instruments is a most important one, and deserves a careful consideration from every student who wishes to practise Lithotrity with success. There is much more to be gained by a knowledge of the minutiæ of the mechanical arrangements adopted in the construction of the lithotrite than is generally supposed.

It should be remarked at the outset, that every point relating to the form, weight, size, and construction of a modern lithotrite, has been arrived at through long years of experience and careful attention to the necessities of hundreds of cases, and after the occurrence of numerous contingencies, not anticipated at first, but now provided for. No study of Lithotrity, whether it be pursued on the body or without it, is of much value, apart from a preliminary knowledge of the mechanical principles on which lithotrites are, or should be, constructed.

In order to save misunderstanding and circumlocution, it may be premised here that all lithotrites will be regarded as possessing the following principle parts. The blades (when acting together often called "jaws"), the shaft, the sliding-rod, and the handle (fig. 49). The blades are two in number; one distal (from the handle), immovable, continuous with the shaft, called "the female blade;" the other, proximal, movable, continuous with the sliding-rod, and called

FIG. 49.

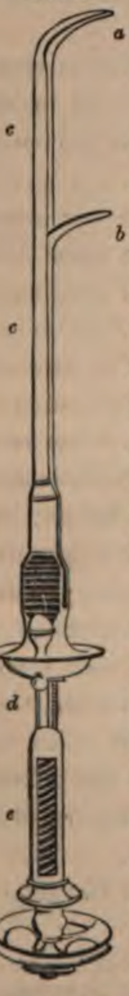


Fig. 49. A French Lithotrite; to show parts. *a*, female blade; *b*, male blade; *c*, *c*, shaft; *d*, sliding-rod; *e*, handle.

"the male blade." The shaft is perfectly straight, and forms the longest portion of the instrument, corresponding to the average length of the urethra and three or four inches over. The sliding-rod is received into a longitudinal channel, occupying the entire length of the shaft; it bears at one end the male blade, and at the other it is acted upon by the mechanical power employed. Upon its upper surface, near to this end, is marked a scale which informs the operator to what extent the blades are separated, when these are hidden, as in the bladder, from his eye. The handle not only serves the purpose which its name implies, but contains, or has affixed to it, the mechanical power which is destined to move the male blade.

Lithotrites may be regarded as naturally occupying two distinct classes; and the distinction is of much practical importance. It is grounded upon the nature of the work required to be done by them, corresponding to which must be the form of the blades or jaws which are to be brought into direct contact with the stone. The modes of applying power—and these are several—will be considered subsequently.

Class I. Lithotrites with the female blade open or fenestrated; or instruments for crushing the stone into fragments.

Class II. Lithotrites with no opening in the female blade; or instruments for reducing the stone or the fragments to a granular state; already said to be the ultimate object of all Lithotrity.*

---

* It has been customary with many in this country to apply the term "lithotrite" to the fenestrated instrument only, and to call those instruments which have entire or plain blades "scoops." This is an error, since instruments of both classes are employed for *crushing* the stone: it is, therefore, desirable to

Before considering these separately, it will be well first to advert briefly to certain principles of constructing the blades which apply equally to both these classes.

1. The blades and the shaft form an angle with each other, which is always somewhat greater than a right angle. But the greater the angle, the greater is the sacrifice of power, and *vice versâ:* power acts disadvantageously through blades whose inclination from the shaft is more than 120°. On the other hand, the greater the angle the more easily the instrument passes through the urethra, a question of importance in some exceptional cases where much irritability exists.

2. The wider the blades the easier is it to catch a stone or fragment, and the less likely is either when caught to slip from the grasp of the instrument. But power acts disadvantageously through wide blades: a narrow male blade forces its way through a mass which could not be penetrated by a wide one; on the other hand, the grasp of a small fragment is much less certain to be secure when one and especially when both blades are narrow, than with two wide ones.

3. The surface of the male blade which is opposed to the female blade is roughened, in order to render the grasp more sure, and because pressure between roughened surfaces tends to separate cohering particles; between smooth surfaces it favours their forming into a mass. If the object is to break a hard stone, the male blade should have a toothed surface, that each of the several projections may exert a wedge-like action on the resisting mass. But if

---

speak of them both as lithotrites. The custom is due to the fact that the fenestrated instrument only was used formerly in London for crushing, and the other for merely removing débris—a practice not much pursued in modern Lithotrity.

the male blade consists of a single and, therefore, rather large wedge, although it will act most powerfully and efficiently on a large and hard stone, it is, nevertheless, an objectionable instrument, because, as may easily be proved by experiment, the divided fragments fly off at right angles with great force, and endanger the walls of the bladder, as I have long ago verified. Hence, the male blade must not be too narrow in any case.

Class I. The lithotrite with an open or fenestrated female blade (figs. 50 and 51).

FIG. 50.

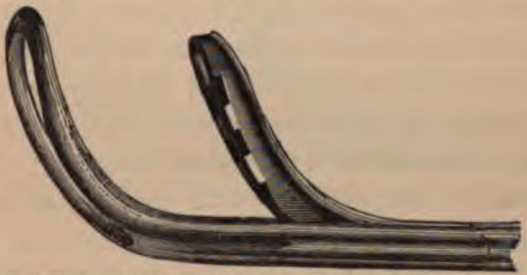


Fig. 50. Fenestrated female blade, with large teeth: a large and powerful Lithotrite.

FIG. 51.

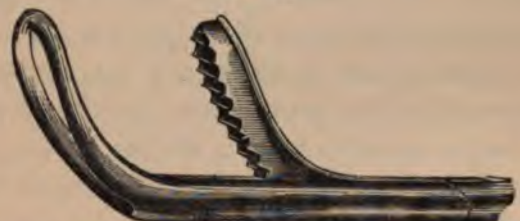


Fig. 51. Fenestrated female blade, with small teeth: rather less powerful than preceding.

The peculiar function of this instrument is to reduce a stone into fragments; it does not granulate. It is useful for very hard stones, and for all which are of really large size; indeed, it is necessary for such at the outset, because instruments of this construction only are strong enough to attack them successfully. As regards the single attribute of strength, it surpasses all other lithotrites, but it is to be remembered at the same time that it is also, by comparison with others, more dangerous. Its employment requires great care, because the edges of the blades are necessarily angular, and may be sharp; because these edges meet each other accurately, and the mucous membrane may therefore be readily included between them;* because the fragments produced by their action being forcibly driven through a large aperture, are necessarily, for the most part, large, rough, and angular; and are, therefore, calculated to produce irritation in the bladder. Lastly, the jaws are longer than those of other instruments, and can, therefore, be less readily and less safely turned, or in any way manipulated, in the vesical cavity.

Class II. The lithotrite with plain or entire blades. (See figs. 52 and 53.)

In this class we have some that are admirable crushing instruments, properly so called; others are employed solely to granulate the fragments. The first or strongest kind may be used to crush stones of medium size, say nearly all up to about an inch in diameter, if not very hard, and larger ones if friable; but the special function of this class is to reduce calculous matter, whether existing as such stones, or as fragments produced by fenestrated instruments, to a granulated condition.

A well-constructed lithotrite, with plain blades, for the purpose of crushing stones of small and medium size, has

---

* Although always made with sharp and accurately fitting edges, there is no reason why these should not be bevelled; the accident would then be less liable to happen. This alteration has been recently made, at my suggestion, by Weiss, and by Coxeter, and certainly with advantage.

FIG. 52.

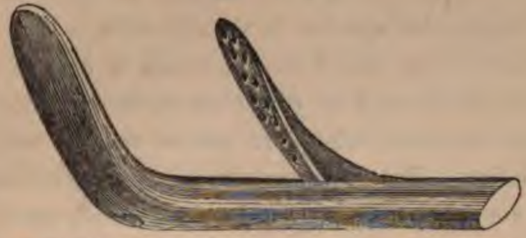


Fig 52. Lithotrite with plain blades, but the male blade narrow.

FIG. 53

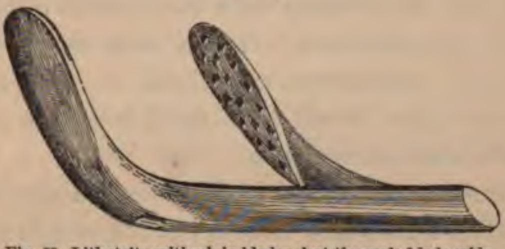


Fig. 53. Lithotrite with plain blades, but the male blade wide.

a wide female blade, and a narrower male one, so that the force applied through the latter may act efficiently by its narrow surface, and not be diminished by distribution over a large one. A comparison of fig. 52 with 53 will exemplify this remark. The narrow male blade of fig. 52 will readily make its way through a small stone or fragment lodged against the female blade, the width of which aids in retaining the fragment in position; while the male blade of fig. 53, nearly as wide as the female blade to which it is opposed, will granulate small fragments admirably, but will be inefficient against a hard mass of more than half an inch in diameter. Moreover, were an attempt so to use it successful, the jaws of the instrument might become packed so tightly with detritus, as to render its dislodgment somewhat difficult.

The occurrence of this condition, viz., "packing" with débris, is provided against in the lithotrite with a narrow male blade, from the jaws of which it can be always dislodged at the will of the operator, by a method which will be explained when we arrive at the subject of manipulation. But it is important that the female blade should not be too hollow or deeply recessed, especially at the angle, or that part where the blade joins the shaft, since complete dislodgment of débris from this spot is difficult, and its presence here interferes with the perfect action of the instrument. It is a fault met with in too many of the instruments made both here and at Paris. In any case there should be a small hole at the angle to pevent too much accumulation.

The crushing instrument of this class is a very safe and efficient lithotrite where it is applicable, and is possessed of considerable power and strength, although not equal in this latter respect to those of the first class. The margins of the jaws are not sharp, but well bevelled; moreover it is scarcely possible, from its construction, to seize or nip a piece of mucous membrane between the edges of the male and female blades, a considerable interval existing between them (the edges only) when the blades are closed. This instrument will also perform the office of the old "scoop" when required, as well as any other instrument made. Its blades being flat, much débris may be contained between them without unduly enlarging the calibre: their capacity in this respect is remarkable. Further, the blades are shorter than those of the powerful fenestrated instruments, and will therefore not easily retain their hold on a stone which is much too large for their power; it will be obvious that the shorter the blades, the more readily will a large stone slip from their grasp as the screw power is applied; so that they are to a certain extent able to reject a stone much beyond their capacity to crush. Lastly, it may be remarked, that the construction of this instrument, when properly made, provides that if, by any mischance, its power is overtaxed, and fracture of the instrument at some spot is inevitable, this *must* take place at the angle of the male blade (that is, its union with the sliding rod), so that the instrument can be withdrawn, and only a very small portion, not too large to traverse the urethra, will be left in the bladder. There is no more fear of this occurrence, however, if used with prudence, than with any other instrument; still, it is as well to be aware that this admirable provision exists against possible accident.

Thus much for that portion of the lithotrite which transmits the applied force, by direct contact, to the stone itself. The next subject for consideration is that portion of the instrument by which the force is accumulated and applied.

The wheel, and the screw, are the mechanical powers commonly adopted for this purpose; besides these, force can be transmitted by direct manual pressure, and by percussion.

The conditions necessary to the construction of this portion of a good lithotrite are—first, power in abundance; second, power which can be quickly applied, and in small or large quantity at the will of the operator; third, power which can be disengaged and re-applied with ease and rapidity; lastly, all these conditions to be fulfilled, and to be made effective in small compass and without the necessity for harsh movements capable of communicating injurious concussion to the bladder or urethra.

The rack and pinion is that form of wheel-power which is now employed, and it is well adapted for many of the requirements in Lithotrity. Its application was originated by Sir William Fergusson in 1834, to supersede the original apparatus of Heurteloup. He has employed it ever since, in all sizes and for all purposes; the most recent model, which is made with great nicety by Mr. Matthews, of Portugal Street, is represented in the adjacent wood-cut (fig. 54).

FIG. 54.

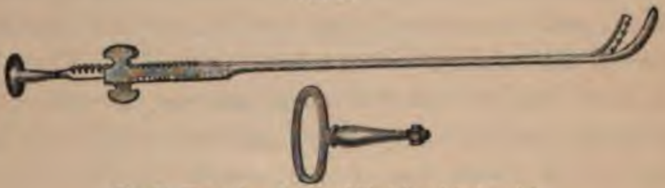


Fig. 54. The rack and pinion Lithotrite: latest model.

Increase in the diameter of the handle of the pinion, increases, of course, the power, and *vice versâ*; and this diameter should be made to correspond not only with the strength of the blades which have to support it, but with that of the individual by whom it is to be used.

This remark on the relation which the leverage attached to the power ought to bear not only to the resistance at the blades, but to the muscular strength of the operator, applies equally to all lithotrites. If the surgeon has a powerful hand, the instrument-maker will not increase the diameter of the handle beyond, at all events, an average size: if he is deficient in muscular power, the handle ought to be larger. The rack and pinion is a useful form of mechanical power, because it enables the operator to apply force, when he wishes, by a jerk or impulse,—in other words, to augment with rapidity the rate of pressure, an action of which the screw is less capable; and this is a kind of force which in some cases tells on the stone when mere uniform screw pressure fails. It stands midway between the screw and direct percussion. It is, perhaps, somewhat more susceptible than the screw of being controlled and modified by intelligence, through the medium of the hand, but, unlike the screw, sustained effort is necessary to exert sustained pressure.

The screw is that form of mechanical power which is most commonly employed in the lithotrite. It admits of great pressure being gradually, evenly, and continuously applied. Here the amount of power corresponds with the length of the transverse lever forming the handle of the screw. Also, with practice, quick impulse and percussion are both compatible with the action of the screw. One great drawback in the original screw instruments (fig. 58, p. 174), and therefore in most of those hitherto used in this country, is the expenditure of time by unscrewing, in order to open the jaws of the lithotrite which have been closed in the act of crushing. No matter how often the screw is turned home for this purpose, so often must it be deliberately unscrewed before the jaws can be opened again for a fresh search. Time, as we shall hereafter see, is of great value in Lithotrity, and everything which economizes it, conduces materially to the success of the operation. The abolition of any unnecessary movement is so much clear gain to the process, since there is necessarily a correspondingly diminished chance of producing disturbance of the bladder. It was long a desideratum to produce a lithotrite in which the screw should remain as the mechanical power, and yet no unscrewing be necessary, in which, also, rapid impulse and percussion could be applied.

The common screw movement, therefore, is mainly applicable, like the rack and pinion, to powerful fenestrated instruments adapted for dealing with large and hard stones or fragments; to perform the delicate operation of finding and granulating the smaller fragments, a different mechanism is desirable.

The desideratum referred to was first supplied by M. Charrière, the well-known surgical mechanist of Paris, in the very ingeniously devised lithotrite, commonly distinguished by his name, or by that of Civiale. (Fig. 55.)

The action provides that, after the male blade has been screwed home, it can be withdrawn instantly to any extent without unscrewing. The movement may be described as follows :—The male blade having been screwed home on a fragment, the operator makes a quarter turn of a movable disc in the handle (fig. 56), when the screw power is instantly detached from the sliding rod and male blade, which may now be withdrawn to the full extent, or moved backwards and forwards in any way, for the purpose of finding a fragment; when this has been seized, a reversed quarter turn of the disc is made, the screw power is attached, and the fragment is crushed by screwing home. Supposing, however, that the calculus does not readily yield to screw pressure, and there is reason to

FIG. 55.

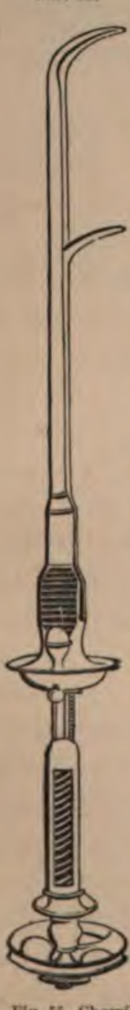


Fig. 55. Charrière's improved Lithotrite.

Fig. 56.

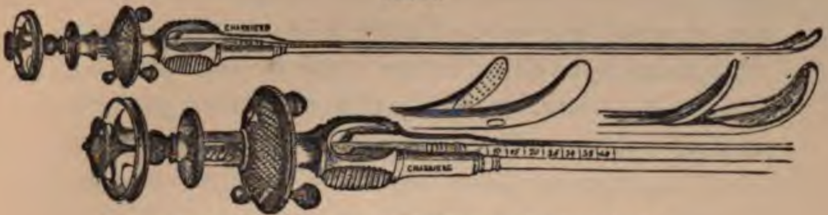


Fig. 56. The handle of Charrière's Lithotrite, showing scale, &c.

believe that percussion may be useful, the screw power is again detached without risking the grasp of the fragment, and a smart tap or two made on the end of the lithotrite communicates direct its effect through the male blade. Or, simple manual pressure may be substituted if preferred. The attainment of these objects by this lithotrite constitutes a great advance on instruments of the pre-existing construction.

Very recently attempts to improve this action have been made by Coxeter and by Weiss. The former disengages the screw by means of a kind of trigger beneath the handle, which can be done by a finger of the left hand, which holds the lithotrite, and does not require the other hand as in the case of the French instrument. Subsequently, Mr. Weiss conceived a more simple method of changing the sliding into screw-action, and *vice versâ*, which is governed by touching a button in the handle. My own design also of a new cylindrical handle has been associated with this, and enables the operator to employ the lithotrite with greater ease, dexterity, and nicety, than can be attained with any previously existing lithotrite.

It is the power of employing this instrument with the lightest possible hold by the finger and thumb, in any direction, which imparts its peculiar facility for the detection of small fragments. This will be especially shown when that subject comes in due course for consideration; but I may say here, that it is perfectly easy for a practised hand to elicit an audible note from a fragment of calculus in the bladder, the size of which fragment is not larger than a split pea. This I have demonstrated too often on the patient, not only in my clinical lectures here, but in public in Paris, for the smallest doubt to exist of the fact. It is one, however, the importance of which cannot be over-stated in relation to the success of Lithotrity. The same cylindrical handle, moreover, enables the operator to hold the instrument with a firm and steady grasp when this is required. On account, then, of these qualities, which are now bringing it into very general use, both here and abroad, it will be assumed to be the lithotrite employed in the directions hereafter given, unless a special statement to the contrary is made.

FIG. 57.

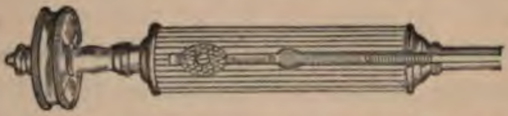


Fig. 57. The cylindrical handle of the Lithotrite described.

Other methods of applying power by the wheel, the screw, by percussion, &c., have been employed, but they have, for the most part, become obsolete, and belong now rather to the history than to the practice of Lithotrity, and therefore will not be regarded as coming within the scope of our consideration.

Lithotrites vary in size, according to the purposes for which they are required. Powerful adult lithotrites may measure in the shaft, about 10 or 11 of the catheter scale, and about 13 or 14, as the mean of the two diameters (lateral, and from before backwards) of their blades. Lithotrites of moderate average power may be equal to 9 or 10 in the shaft, and 12 or 13 in the blades; small ones, 7 or 8 in the shaft, and 10 or 11 in the blades. For boys, 6 or 7 in the shaft, and 9 or 10 in the blades; and the smallest of all, 4 or 5 in the shaft, and about 7 or 7½ in the blades. The two last are not frequently required. Sir William Fergusson has of late considerably diminished the size of the shaft in his rack and pinion lithotrite (fig. 54). There is advantage in this, provided strength is not unduly sacrificed; for a slender shaft in the urethra, diminishing the friction of the canal on the instrument, permits greater mobility and freedom to the lithotrite, and favours nice perception in exploring. It would be advantageous, I think, to extend this principle to the construction of all modern lithotrites, many of which had the shaft unnecessarily large and heavy.

All the parts of a lithotrite should work very smoothly and easily, so that the slightest contact with a small fragment can be instantly perceived, a result wholly impossible if the sliding rod does not work with perfect ease and freedom. All lithotrites intended to deal with hard or large stones, should be cut from the solid steel; the best and strongest instruments for this purpose are those of English makers. For reducing fragments and small stones, this costly mode of construction is wholly unnecessary; the shaft may be forged, or formed from a tube which is drawn into shape, instead of being cut from the solid metal.

Other instruments used in Lithotrity.

These will be simply enumerated here. Their description will be given hereafter, when their practical application is considered.

Evacuating catheters. Injecting apparatus. Urethral forceps. Urethral lithoclasts.

CHAPTER X.

LITHOTRITY.—THE SYSTEMATIC APPLICATION OF IT IN THE VARIOUS STAGES OF THE OPERATION.

Position of the Patient; ordinary and exceptional.—State of the Bladder; Injections.—Introducing the Lithotrite.—Finding the Stone; different Methods.—Crushing the Stone.

I SHALL now proceed to describe each one of the separate proceedings which are necessary in effecting a single performance of Lithotrity. And in future each application of these proceedings will be denoted by the word "sitting," as equivalent to the French word "séance;" and the word "operation" will be applied to the sum total of sittings necessary to relieve the patient of his stone.

At the outset it is necessary to consider—

First, the position of the patient during the performance of Lithotrity.

Two positions may be described as necessary in Lithotrity: an ordinary position, and an exceptional or extraordinary. The latter is, however, suitable to many of the cases to which Lithotrity is applicable.

In the ordinary position, a patient lies easily, on his back upon a couch; which, for the convenience of the operator, should be higher than a common sofa, else he must stoop and be otherwise much constrained in his

FIG. 58.

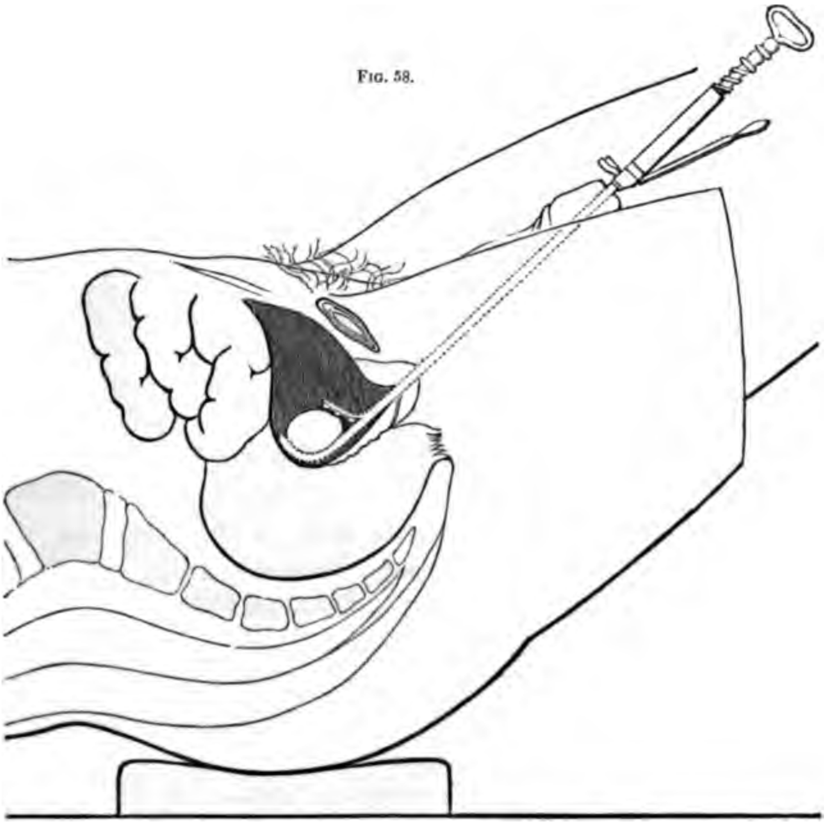


Fig. 58. The first or ordinary position. Common screw Lithotrite, with a stone rather above middle size.

movements. It should be at least thirty inches high; firm and steady. The ordinary bed is the best, provided the patient is placed on a mattrass, so that the pelvis does not sink, a position fatal to good practice; he must be brought with his right side close to its edge. The pelvis is to be placed just above the plane of the shoulders, which must remain on a level with the rest of the trunk, the head only being raised on a pillow: this constitutes the ordinary position. A firm cushion, about two or three inches thick, should support the pelvis; an excellent substitute, to be found in any bedroom, is a common pillow rolled up tightly in a towel, which is then fastened by pins.

The thighs are to be separated a little, so that there is a clear interval of about twelve inches between the knees, and each knee may be supported on a small pillow, leaving the space between the legs clear for the operator.

In this position the stone generally lies a little behind the neck of the bladder, and may be easily found and acted on by the lithotrite, provided the bladder and prostate are normal.

In the exceptional position, the pelvis is raised from four to six inches above the level of the shoulders; a firm cushion of sufficient thickness is placed beneath the pelvis, so as to support the sacrum and tubera ischii. The thighs are slightly raised; they must not incline from the pubes downwards, or the position of the pelvis will be interfered with. The abdomen, on the contrary, inclines backwards from the pubic symphysis. The stone now lies towards the posterior wall of the bladder, at a little distance from its neck, varying in proportion to the degree of elevation of the pelvis. This position is generally desirable when there is an enlarged prostate, behind which a stone is frequently concealed; it is so often when the patient is very stout, and the abdomen protuberant, and in searching for last fragments, or for a small stone, in any case where its presence is suspected, and there has been want of success in a previous search by the ordinary position. It is not so comfortable to the patient as the latter, but the sitting should never be long enough to render the position very irksome, much less painful.

Fig. 59.

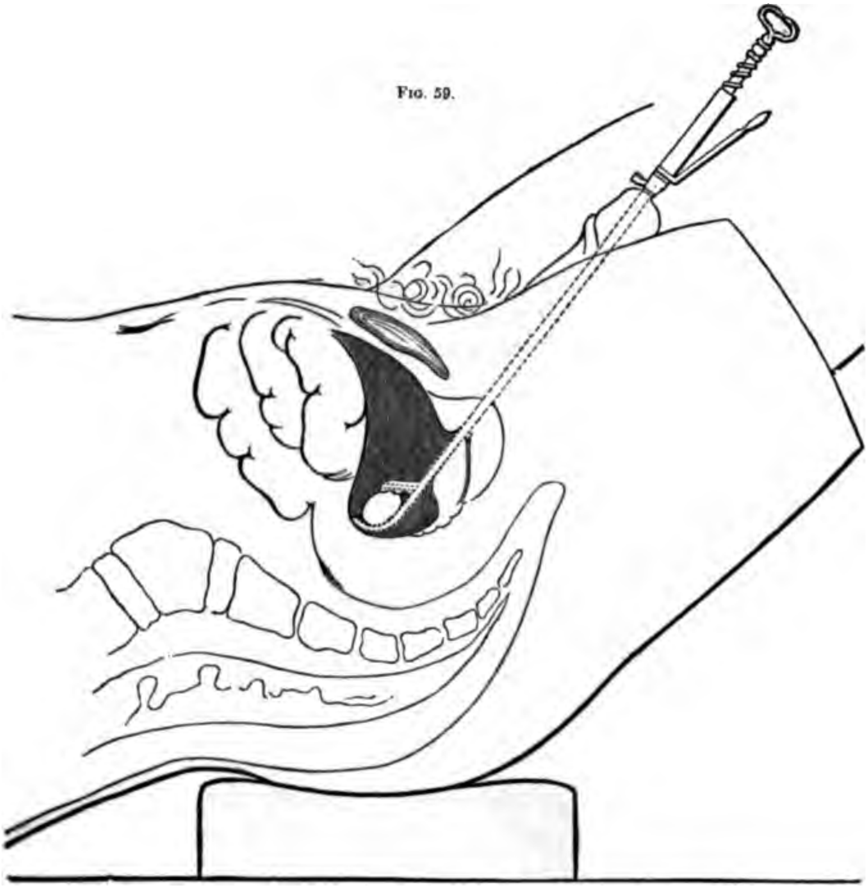


Fig. 59. Second position: prostate enlarged; stone removed by this position to the back of the bladder

Thus it is that a couch, of which the plane can be altered so as to raise the feet twelve or fifteen inches, sometimes meets all the indications with the least amount of uneasiness.

In those few cases in which it may be decided to perform Lithotrity for children, the pelvis should also be a little

FIG. 60.

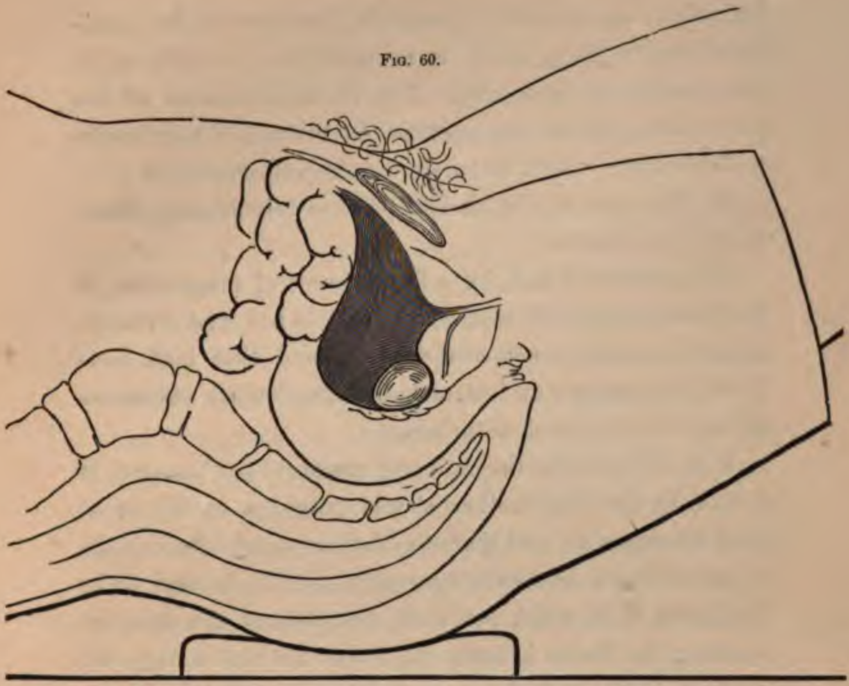


Fig. 60. The first or ordinary position: enlarged prostate; stone not easily seized in this position.

elevated, otherwise the stone will lie close to the neck of the bladder; the position of this viscus in children rendering that the natural situation for it in the ordinary recumbent posture.

The object of determining the position in Lithotrity is important; namely, to prevent the stone from lying close to the neck of the bladder, which it almost certainly does if the pelvis sinks a little below the horizontal line of the body. The centre of the cavity and space beneath it, form the area of operation. The neck, which is sensitive, easily injured, and ready to take on inflammatory action, is to be kept free from all unnecessary mechanical irritation: an important principle, hereafter to be considered in its place, which is never to be lost sight of in the conduct of Lithotrity. The elevated position of the pelvis also enables the operator to reverse the lithotrite with facility; which he rarely can do well otherwise.

2. The state of the bladder prior to commencing Lithotrity. Injections.

It is presumed that, by a fair amount of preparation, it has been ascertained that the bladder is not over-irritable, that the urethra is not over-sensitive, and that both have borne the presence of instruments without much uneasiness or any constitutional disturbance.

It is desirable for the safe and successful performance of Lithotrity that the urethra should possess a calibre of at least average size, and that the bladder should be capable of containing a moderate amount of fluid. It used to be held that if it could not hold four ounces the area for working the blades is too small, unless the object be to use a small instrument upon small fragments, in which case two or three ounces might be sufficient. A quantity much exceeding eight ounces makes the area of operation too large, in which condition a small stone or a fragment may elude our search, and the movements of the instrument necessary to conduct it are consequently greatly increased, a circumstance which is in itself an evil. The plan which was most commonly adopted was, to withdraw the urine by catheter immediately before operating, and to inject a known quantity, say five or six ounces, of water at the temperature of 100°.

I soon discovered, however, that all this was quite unnecessary; and for several years have never made any preliminary injections, nor even desired the patient to retain his urine before the hour fixed for operating. Indeed, his very attempt to do so would often defeat the object; added to which, some nervous anxiety beforehand would often compel him to pass water immediately before or at the surgeon's arrival.

Perhaps three or four ounces may as a rule be always present with advantage, especially for young operators. Nevertheless, I am bound to say that, with instruments constructed on the principles laid down, no mischief can be done by proper manipulation in the empty bladder; and, for myself, I as frequently operate in that condition as not. By not insisting on this preliminary injection of water, much unnecessary manipulation and the consequent pain and irritation are saved to the patient. The introduction of the lithotrite commences the sitting, the duration of which is thus shortened more than one-half.

If the patient cannot retain his water more than twenty or thirty minutes, he may require more preparation; since, if an attempt is made to compel the bladder to retain a larger quantity than it tolerates comfortably, uncontrollable contractions of it are produced, pain is occasioned, and the organ is placed in an unfavourable condition for Lithotrity. It is useless to contend with the bladder; and any contest engaged in will certainly end in the discomfiture of the operator. The organ must be coaxed into obedience, not forced. At the same time it is no less certain that the only method of subduing irritation is, sometimes, to crush the stone, especially fragments; experience only can determine the cases in which one is to "prepare" the patient, and those in which to operate forthwith. With the milder methods and better instruments of modern lithotrity, the latter alternative I believe now to be much more commonly presented than the former.

That condition of the coats of the bladder which is most favourable to Lithotrity is one of healthy tonicity, a condition in which the organ contracts upon its contents sufficiently to form a reservoir of tolerably regular form. An abnormal irritability, or disposition to contract, is objectionable on the one hand; a flabby, unexcitable state of the coats is unfavourable, although in a less degree, on the other. It is so, because the stone is apt to be partially enveloped, it may be, hidden in loose folds of the bladder; because the viscus, in place of forming by its inherent tonicity, a somewhat ovoid figure, is influenced rather by the pressure of surrounding viscera, and may take any irregular form which they determine. Such a condition may, perhaps, be temporarily improved by the stimulus of injection. The urine is withdrawn, a known quantity of water is injected, and if it is much cooler than the blood, say at 70° or 60°, the stimulus to slight contraction is usually increased. The want of tonicity in a bladder presents a state of things which resembles the condition of the bladder in the dead subject. Useful as the practice of Lithotrity is on the subject, in relation to the manipulation of instruments, it should be remembered that the condition of the bladder is different from that which exists in the healthy living body. In the dead body the stone does not lie at the neck of the bladder, but falls anywhere in the flaccid viscus, which position, and the pressure of adjacent viscera, render the lowest. By depressing the jaws of the lithotrite into the bas fond, after the system of finding the stone much adopted in this country, the stone of course rolls into it. But this result is by no means a matter of course in the living. When tonicity is active, there is a constant tendency in the muscles of the bladder to roll a large stone towards the neck, a fact of importance, and the result of this action, though much modified by the position of the body, is by no means altogether counteracted by it.

3. The mode of introducing a lithotrite.

This varies materially from that by which a catheter is passed into the bladder, and it is important that the difference should be explained and observed. The difficulty frequently encountered in introducing the lithotrite is generally due to ignorance or neglect of the distinction existing between the two operations.

In catheterism, a smooth continuous curve or sweep is made from the external meatus into the bladder. Throughout the entire movement, the instrument passes through a series of continuous curves; the shaft of the catheter, at first horizontal (supposing the patient to be recumbent), is gradually moved upwards to the perpendicular, and downwards to the horizontal again, in a direction precisely opposite to the first position.

In passing a lithotrite, the continuous sweep will not be successful in carrying it into the bladder; the terminal angular part constituted by the blades would thus be brought into hazardous contact with the upper part of the urethra before the pubic arch is passed. On the contrary, the shaft of the lithotrite must be maintained in one position for a considerable part of its course. This will appear in describing the movement in detail.

The operator places himself on the right side of the patient, and stands with his back turned partly towards the head of the couch, his left side being to the patient's right. Having warmed and well oiled the lithotrite, he holds it lightly with his right hand, in a horizontal position, the blades pointing downwards, and raises the penis with his left; and as he introduces the blades into the urethra, the left draws gently the penis over the angular end of the instrument, which descends in this manner down to the bulbous portion of the urethra, the shaft rising gradually towards the perpendicular. Having arrived there, it is not now to be depressed as in catheterism, since this movement raises the point of the blades against the roof of the urethra in front of the deep fascia above the narrow orifice of the membranous portion, while the large capacity of the bulbous urethra favours the malposition described, and, if force is used to overcome the difficulty, laceration will probably take place. This, indeed, is the accident which, more commonly than any other, happens in the hands of beginners, or with those who are not aware of the proper course to be pursued. In order to pass the blades easily and safely through the narrow membranous portion, it is necessary to maintain the lithotrite a few seconds at or near the perpendicular, permitting it to progress slowly in that position. This proceeding is accomplished by permitting a part of the weight only of the instrument to act as the propelling power, while the penis is drawn upwards a little, in the same, that is the vertical, direction. In this position the blades slide through the bulbous portion, enter and traverse the membranous portion, and arrive at the prostate. Then, and not before, the operator gradually depresses the instrument towards the patient's thighs; the blades rise up through the prostatic portion into the bladder, a movement which is rendered more easy if a very slight lateral rotary motion is given to the instrument at this part of its progress. At the same time the fingers of the left hand may be gently pressed on the pubic symphysis to relax the suspensory ligament of the penis; at all events the disagreeable sensation of strain upon it experienced by the patient at this moment is relieved by so doing, and the movement onwards of the instrument is facilitated, especially if the shaft has to be much depressed to surmount any obstacle at the neck of the bladder. In ordinary, that is normal, conditions, the shaft of the lithotrite at the entry into the bladder forms an oblique line and an angle of about 20° to 30° with the horizon; and this it continues, as it slides easily and freely down upon the trigone to the posterior wall of the viscus. It will be obvious that the urethra now entirely loses its curve, being occupied throughout by the straight shaft of the lithotrite.

The angle which the blades form with the shaft varies, as has been already seen; in some the blades describe a curve from the shaft to their points. The more angular, however, the union between the blades and shaft, and the smaller the angle so described by their axes respectively, the more necessity is there for following the directions just given.

For those who prefer it, the instrument may be passed on the patient's left side, as in catheterism; but, if so, the operator must afterwards go round to the right side to perform the operation of crushing. It is, however, equally if not more convenient to introduce it on the right side, in which case time and movement are economized to a slight extent.

4. To find and seize the stone.—This is a very important subject, and about which there has been no little discus-

sion, since practical men have been divided in their opinions respecting the course to be followed.

It will be supposed here that the lithotrite last described (fig. 57) has been easily introduced, and that its blades have passed into about the centre of the vesical cavity. The proper method of holding the instrument is the first step to be considered, since the facility with which the operation is performed will much depend on the system of manipulation adopted. The surgeon should be completely familiarized with the lithotrite, and with the best position and action for his hands upon it, long before he ventures to operate in the living bladder, so that he may instinctively hold and manage the instrument according to the rules laid down, and has not to recall them to his memory at that moment. Without doubt, the best method with the existing lithotrites has been ascertained by practice and observation; viz. that which enables the operator (bearing in mind our guiding principles) to exert the largest amount of influence on the stone, with the smallest amount of disturbance to the bladder. Even supposing this were not the case, it would be advantageous to the operator to practise one method as the rule, and so acquire a facility in the use of the lithotrite, which practice by an uniform method alone can impart; but it is doubly so in the circumstances just stated.

First, the manner of holding and employing the lithotrite when the blades have arrived in the cavity of the bladder.

The left hand being above the instrument, the cylindrical handle is at first lightly held between the thumb and three fingers, the little finger being free, so that a slight rotary movement of the instrument can easily be made on its axis, when necessary. The wheel-shaped end of the sliding rod, which terminates in the male blade, is then held between the thumb, index, and second fingers of the right hand (*see* fig. 61), so that it can be drawn out, and pressed in, at pleasure; corresponding to which movements, of course, the blades at the other extremity are opened and closed.

FIG. 61.

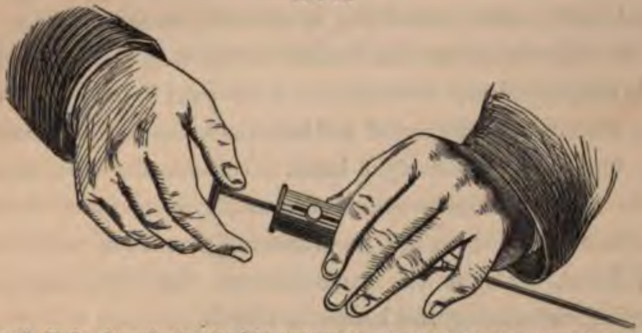


Fig. 61. Mode of employing the Lithotrite with cylindrical handle in searching. The left hand holds the cylinder lightly, while the right opens and closes.

If a stone or a fragment be seized, the fingers are to remain on the wheel with slight pressure to retain it, and the thumb is to be extended to draw upwards the button, which act suffices to change the sliding into

FIG. 62.

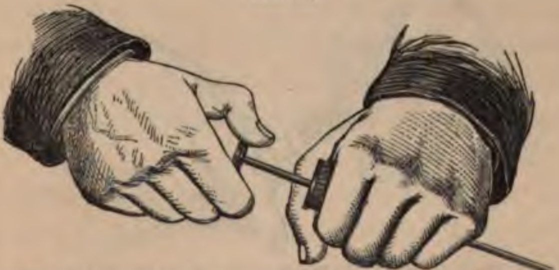


Fig. 62. The instrument firmly grasped in the left hand, while the right crushes by screwing home.

the screwing action. A turn of the wheel now screws home the male blade, and crushes what has been caught. If this is small, the fingers of the left hand remain in their place; if it is large, and especial steadiness be required, the cylindrical handle is grasped in the palm of the left hand, and perfect immobility is ensured (*see* fig. 62).

In order to reverse the blades in searching for fragments, it is only necessary to rotate the cylindrical handle between the thumb and fingers of the left hand, the wheel remaining unmoved in the right hand. Indeed, the most complete and exhaustive series of changes in position of the blades is attained in this instrument by rotation with the left hand, while, at the same instant, the right hand is opening and closing the blades in search.

The manner of employing the French instrument may next be described.

The handle is to be held between the thumb and fingers of the left hand, the thumb applied to a knob attached to the disc, the index finger to the other knob attached on the farther side; the second and middle fingers are applied to the handle close to the index finger: the little finger may be free or applied;

FIG. 63.

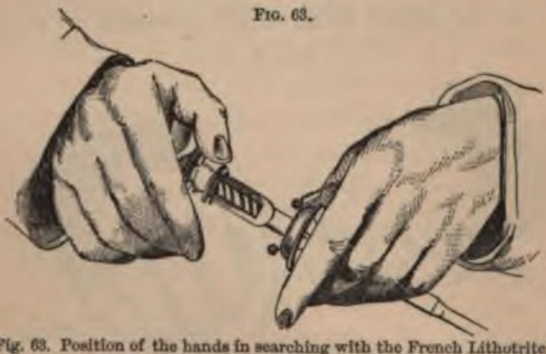


Fig. 63. Position of the hands in searching with the French Lithotrite.

where ease of movement is wanted, as in searching, it is free; where steadiness and immobility, as in crushing, it is applied. The pulp of the thumb is brought into contact with the knob, the last or distal phalangeal joints of the fingers are the parts which come into contact with the opposite side of the handle (fig. 63). Held lightly, but firmly, in this manner, the thumb and index command and control easily the movements of the instrument, and can incline the blades right or left, with very little movement of the hand itself, and, *à fortiori*, without any change or shifting of its hold on the instrument.

The right hand is free to open and close the blades, to turn the movable disc which converts the sliding into a screw action, and *vice versâ*, and to screw home the male blade for the purpose of crushing the stone. The position is represented in the adjacent drawing (fig. 63).

Now, what is the first proceeding in order to find and to seize the stone?

It has been customary to describe two methods of proceeding, conducted on two distinct principles, and necessarily differing also in the details of execution. The first mode, or that which has been commonly adopted in this country, is attributed to Baron Heurteloup, and was employed by Sir B. Brodie. It consists in depressing the blades on the posterior wall of the bladder and endeavouring to make it, by gentle pressure, its lowest part; on withdrawing the male blade the stone falls into the lithotrite, it is said, four times out of five. "If it should not do so"—I now quote the precise words of Sir B. Brodie—"the forceps, without being moved from its situation, may be gently struck with the hand on one side, or on its anterior part, and the slight concussion thus communicated to the bladder, will probably be sufficient to dislodge the calculus, and bring it within the grasp of the instrument. If it should be otherwise, the forceps, being closed, may be very gently and cautiously turned to one side or the other, so that the curved extremity of it may make an angle of 25° or even 30° with the vertical line of the body, then opened and pressed in the direction of the rectum in the manner already described."*

The principle of this proceeding is, to place the crushing instrument in a position presumed to be advantageous, and to bring the stone to the instrument in almost any way, rather than apply the instrument to the stone.

The other mode is that of Civiale. He regarded its principle as the reverse of the preceding. By position of the patient, the centre of the bladder and space beneath it are selected as the area of operation; no depression is made; contact between the walls of the bladder and the instrument is, as much as possible, avoided. The instrument is applied to the stone in the situation which this naturally takes, and the operator carefully avoids moving it, or any movements of concussion whatever, however slight. At the same time, it will be understood that the free movements, and complete search in all parts of the bladder, which are essential to successful Lithotrity, and which characterize the modern practice, are only possible with lithotrites of a much more perfect kind than those which were employed by the distinguished operators first named.

We shall now consider the plan in detail. The blades having entered the cavity of the bladder, the instrument slides easily and smoothly down the trigone, which in the living and healthy organ is an inclined plane, although quite otherwise in the atonied and in the dead bladder.

---

* Trans. Med. Chir. Soc., vol. xxxviii. p. 174.

In many cases the stone is grazed by the instrument as it passes, and the slightest lateral movement of the blades, right or left, will determine on which side it lies. If so, the operator is careful not to disturb it, but he inclines the blades *slightly away from the side on which it lies*, carrying the instrument gently in towards the posterior wall of the bladder, while the male blade is gently withdrawn. It is important always to bear in mind, that as long as the blades are near the neck of the bladder, the male blade must not be withdrawn roughly, since it would impinge on that sensitive part and cause pain or injury. Having done so, he now inclines the well-opened lithotrite towards the stone, slowly closes, and almost certainly seizes it.

But suppose no stone was felt on entering, he is then directed simply to withdraw the male blade an inch or more in the middle line, to incline the blades to the right side about 45°, and then to close them, without altering the axis of the shaft, or otherwise disturbing the central position of the instrument. Thus in almost all positions the stone is seized sideways by the blades of the lithotrite, and very rarely by their extremities. If no stone is felt, he turns them, opened, to the left in a similar manner, and then closes them. Observe, that the blades are always to be opened before they are turned, for this reason : if the turn is first made and the blades are subsequently opened, the chance is that the male blade as it is withdrawn will move the stone away ; whereas if the blades are inclined while open, the stone, if there, is almost certainly seized. This is one of the many apparently minute but important points of which systematic Lithotrity is made up. To return :

it is very rare that the stone will elude the search thus far, but if it does, depress the handle of the lithotrite half an inch or so, which raises the blades very slightly from the floor of the bladder, and turn them another 45° to the left, bringing in fact the blades horizontal to the left; close; if unsuccessful, turn them gently to horizontal on the right, and close. These five positions (vertical, right and left incline, right and left horizontal) explore the bladder fully, middle, right, and left, and will almost certainly find any stone of moderate size in a healthy bladder. The object is at the same time strictly to avoid communicating any jerk to the instrument or to the bladder. In all these movements, if properly executed, there has been barely contact of the lithotrite with the vesical walls, at all events no pressure, nothing to provoke undue pain, or cause contractions of the bladder. If, however, there is an enlarged prostate, causing an eminence at the neck of the bladder, a depression behind it, or the stone is very small, or we are exploring for some fragment, at the close of the case, which is suspected to have eluded previous search, and, also, in some cases where none of these conditions exist, the blades may be reversed so as to point downwards to the floor, and the object sought may then often be secured with ease. If seeking for a small stone or for fragments, we shall employ a lithotrite with short blades, which can therefore be reversed with much greater ease than one with long blades.

In order to do this properly in the normal bladder, the handle of the lithotrite is depressed another inch or so, between the patient's thighs, so that the shaft of the instrument, instead of being directed obliquely a little upwards, is level with, or even points a little below, the horizon ; the blades, supposed to have been already brought to the horizontal as before described, are cautiously turned, about 45° say, to the right (right reversed incline), so as to point obliquely to the floor, which should be barely felt, or very lightly touched by them. No pressure should be made on this part of the bladder by any part of the instrument, and it is easily avoided by depressing sufficiently the handle of the lithotrite. Then close the blades; next, turn them back, that is upwards, over to the left (left reversed incline) ; and close. Lastly, they may be brought round the reversed vertical position, and the floor lightly swept; and this requires the maximum depression of the handle. But when the prostate is considerably enlarged, and a stone or fragments have to be sought behind it, the lithotrite is reversed without depressing the handle (fig. 65).

As a rule, all these movements are to be executed at or beyond the centre of the vesical cavity, the proper area for operating, without hurry, rapid movement, or any other which partakes of the nature of a jerk or concussion, and, if in a fairly healthy bladder, without causing more than a very slight degree of pain to the patient. Nevertheless, there are many cases in which the special spot for searching with reversed blades is close behind the neck of the bladder. With the cylindrical handle this is quite easy and safe; the mode of using it will be shown in considering the removal of small fragments. The operator's eye is also to be so familiar with the scale marked on the sliding-rod, that he knows at a glance the exact interval which it indicates as existing between the blades in the bladder.

FIG. 64.

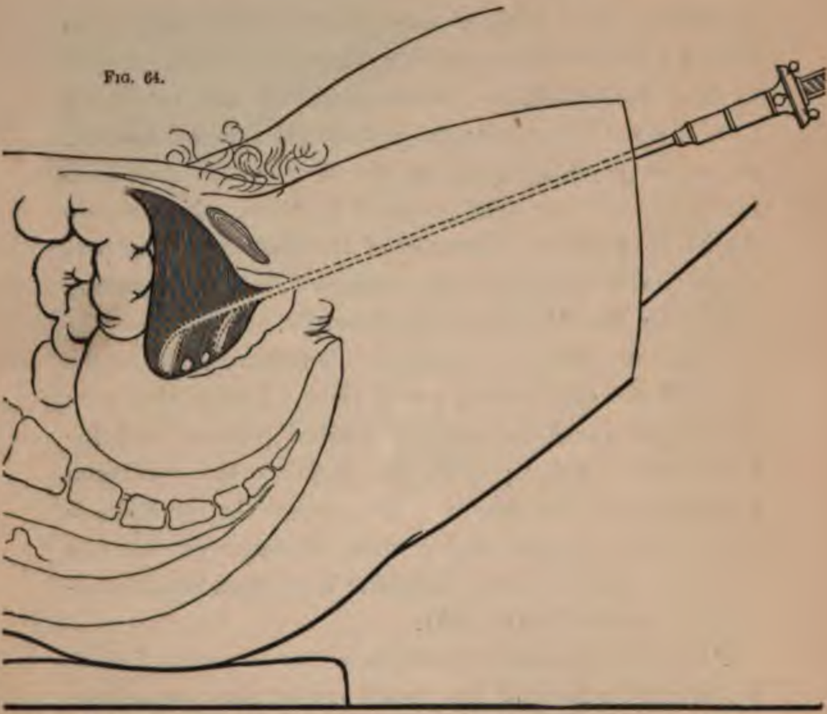


Fig. 64. First position: lithotrite with short blades reversed to crush fragments. The handle is not sufficiently depressed in the drawing: it comes to the horizontal, or even inclines below it sometimes.

It is essential to good practice, while manipulating the lithotrite, to maintain the axis of the instrument, as far as possible, always in the same direction. The blades only are to be moved, the shaft should occupy the same inclination, unless when this is intentionally altered. In screwing home the male blade, the operator is very apt to move the lithotrite also, at each turn of the screw, unless he is conscious of the care necessary to avoid this evil. All lateral movements, all vibration and concussion, necessarily tell on the neck of the bladder and prostatic urethra, where the instrument is most closely embraced, and its mobility is most

FIG. 65.

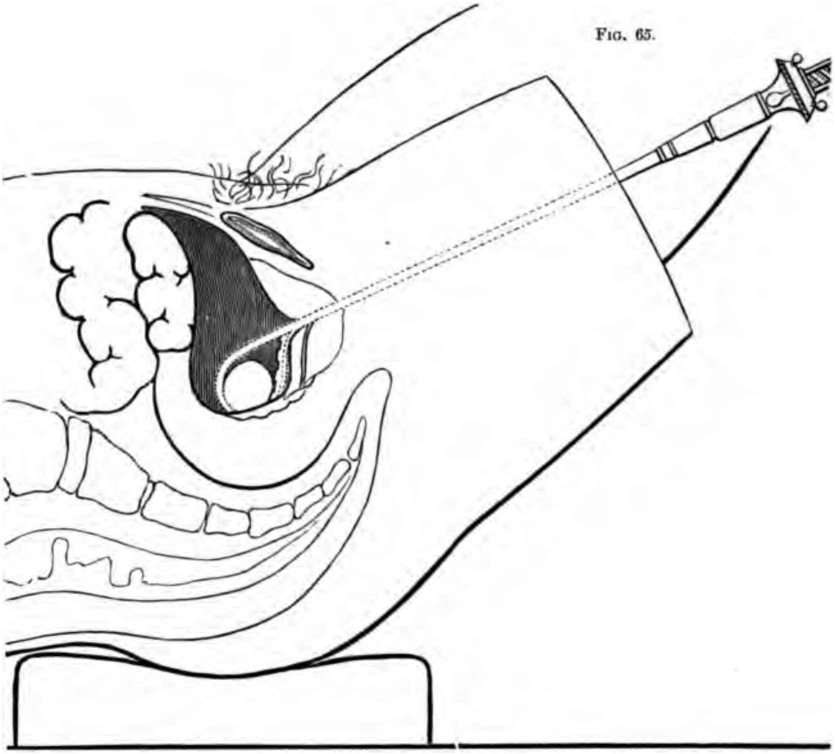


Fig. 65. Second position: enlarged prostate; Lithotrite reversed to seize a large stone.

limited. To that part of the lithotrite which occupies the anterior portion of the urethra much freedom of lateral movement is permitted, and in the bladder the instrument is free, although in a less degree; but the axis, or fixed point, as regards lateral movement, is at the part indicated, which is also the most sensitive spot of the entire passage. Hence the aim of the operator should be to produce in this situation no motion of the lithotrite except that on its own axis. Few of the details of the operation require more practice to master than this.

A rule has been laid down with reference to the situation of the calculus in the bladder. It is said that the larger the stone is the more certain is it to be found lying near to the neck of the bladder in the ordinary recumbent position, while a small one is usually detected at the back of the trigone. Without at all assenting to the accuracy of this remark, at all events in relation to the small stone, which is often close to the vesical orifice, it may be said here that the act of seizing a large stone in this position requires consideration. In this case, the lithotrite is not necessarily to be pushed onwards to the bottom of the bladder; it is sometimes better to incline the blades from the side on which the stone is felt, then to push on the female portion of the instrument only, by itself, as far as it will go, maintaining the male blade at the neck of the bladder; it is now only necessary to incline towards the stone, and it will be seized almost certainly at once. But if the operator commences by pushing on the whole instrument, and then withdraws the male blade according to the ordinary custom, this blade is apt to be drawn against the large stone, which it therefore fails to catch, and presses it back against the neck of the bladder, producing pain, irritation, and perhaps bleeding. As a general rule, I think it may be said, that failure to seize a stone most commonly arises from its close proximity to the neck of the bladder [whatever position is given to the patient], and from the male blade being drawn up against it, at each opening of the lithotrite, in the manner just described.

Such then is the method of finding and seizing the stone, which admits of free movement of the lithotrite in every part of the bladder, and in every direction. The other method alluded to is, no doubt, to a certain extent, an efficient one, but I believe it to be more irritating to the bladder, and less certain for removing every minute fragment towards the end of the operation, while it fails to deal efficiently with a stone lying behind an enlarged prostate. Hence the crushing operation has been often said to be inapplicable when such disease exists, a conclusion wholly unwarranted by the practice and results of modern Lithotrity.

The rules already laid down for finding and seizing, apply more or less to all lithotrites, as far as the rules can be applied with less perfect instruments, this general rule applying invariably to all; viz. the more powerful the lithotrite, that is, the larger and longer are its blades, the less readily are we to adopt the horizontal, and still less, the reversed positions of the blades; the more fluid also is it necessary to have in the bladder. As the long and fenestrated blades are used chiefly for the initial act of breaking up a large stone into fragments, it is obvious also that there is less occasion for the horizontal and reversed movements, since a large stone may almost certainly be seized by the right or left incline.

The old common screw lithotrite requires more change of hand than either of the others. No specific directions can therefore be given in writing which could be of any service. No operator can, I imagine, elect to use it now.

The manner in which Sir William Fergusson employs his rack and pinion instrument is thus portrayed in his own work (Figs. 66 and 67), copied here by permission. I am, however, gratified in knowing that Sir William has recently adopted my lithotrite with the cylindrical handle, with "slight modifications," as he has stated in the latest

FIG. 66.

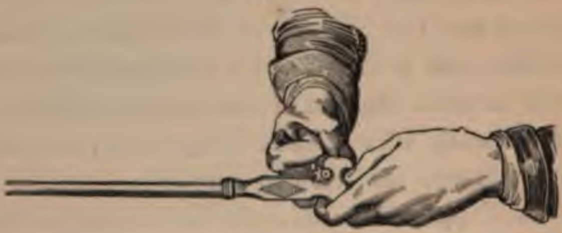
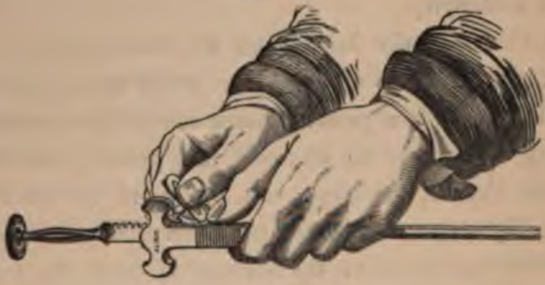


FIG. 67.



edition of his admirable and well-known "Manual of Surgery."

5. The manner of crushing the stone when seized.—Supposing that a hard stone of an inch and a half in diameter is in the grasp of the lithotrite with the fenestrated blade, which, it will now be understood, is the only instrument with which it is safe to commence an attack on it, the screw is to be gradually turned at first, to make the blades bite, since a sharp turn at this moment is likely to drive the stone out either right or left. As the power is increased, which is still to be done slowly, the resistance is felt to relax, sometimes by degrees, sometimes suddenly with a crack, and the stone is broken usually into four or five large pieces, besides some small débris. This being done, the male blade is again drawn out, taking care not to shift

the situation, or alter the axis of the lithotrite, and, almost certainly, one of the large fragments will be picked up. It is then only necessary to screw home, release the screw and open as before. This process may be repeated two or three times, if the instrument is worked at the same spot, and the patient maintains his position. Since the area within which the larger fragments fall is very limited in extent, and remains unchanged if these conditions are complied with, there is no difficulty whatever in finding the fragments readily, provided the operator is content to work in the centre of the bladder, above its most depending part, as determined by the position of the patient, and not to change the place either designedly or unwittingly. The large and heavy pieces fall invariably in the same place, and may be picked up again and again, if this simple rule of keeping the blades in one place is adhered to. Having now broken-up the stone, and, say, crushed two or three times the largest fragments, enough has been done for the first sitting. At all events, the lithotrite should not remain in the bladder more than one or two minutes, which is ample to produce the result described. The patient should at once be warmly wrapped up; a hot bottle put to his feet; while a hot napkin, or a flannel wrung out of boiling water, applied to the perineum and hypogastrium, has a soothing effect, and diminishes any want to make water which may be present, and which it is best to discourage for a short time. During the first twenty-four hours, at least, after the first sitting, with a stone of the kind described, the patient should pass his water as he lies on his back: the large angular fragments are in this way prevented from being driven forcibly against the neck of the bladder. It is because these characters are more marked after the first fracture of the stone than after later sittings, that it is desirable, as a rule, to take every precaution against irritation, local and general, after the first crushing or two. On no account should the bladder be injected or washed out after the first sitting; in the first place, because it is on this occasion particularly desirable to avoid unnecessary irritation; and, secondly, because the first object being mainly to make fragments, no great amount of small débris capable of removal, would probably be found. Here, as on most occasions, the following maxim will be found a judicious one: calculous matter, when brought to a granulated condition, will come away of itself more easily than you can remove it; fragments, too large to pass the urethra, will remain behind, do what you will; fragments small enough to pass with some difficulty should be left to take their chance at first, since, if the bladder is unduly irritated by repeated instrumentation for their removal, some of them will be driven by its involuntary action into the neck of the bladder and urethra with violence. On the other hand, if the bladder remains quiet, they will, probably, not pass until, after a day or two's sojourn in the viscus, their sharpest angles have been worn down a little, when they may be trusted to find their own way safely enough. A meddlesome disposition is not less prejudicial here than in any other department of surgery. If crushing is properly practised, we shall act wisely in mainly committing to nature the task of removing the product. Overhaste, or undue anxiety to see or to display the results of our work, both tend to defeat the ultimate success of the operation.

CHAPTER XI.

LITHOTRITY, ITS SYSTEMATIC APPLICATION CONTINUED.

The Crushing and Removal of Fragments.—Various Modes of Discovering and Crushing the last Fragments.—Treatment following the Sitting.—Impacted Fragments.—Fever.—Cystitis.—Inflammation of the Kidney and Orchitis.—Hæmorrhage.—Retention.—Administration of Chloroform.—Lithotrity in Children.—Recapitulation of Directions for the Performance of Lithotrity.

6. THE crushing and removal of Fragments.—Supposing that, thanks greatly to management and care, no signs of local irritation, and no bleeding, or only a trace of it, have appeared, and no fever has occurred, it is desirable very soon to deal with the fragments. After a period of from two to three or four days, according to circumstances, we should, unless the stone has proved so hard or so large as to require another application of the fenestrated instrument, commence the second sitting by introducing a lithotrite with strong plain blades, of which the male is much narrower than the female blade (fig. 52). As the fragments are now large, and, probably, several in number, simply opening and closing in the first position, or in the right or left incline, will almost certainly secure one at each attempt, and enable us to crush it into smaller fragments, making at the same time a fair proportion of fine débris, a good deal of which generally becomes impacted

between the blades of the lithotrite. Much of this impacted material may be brought away in this manner, if the urethra is capacious; if not, it is desirable to diminish the quantity before removing the instrument, inasmuch as, being powder, it is sure to come away easily enough during subsequent micturition; and there can be no necessity to irritate the bladder or urethra by withdrawing the blades largely impacted. By adopting the following manœuvre, almost all this débris may be removed from the instrument at will. The blades are to be carried to the centre of the bladder, the cylindrical handle is grasped firmly by the left hand (see fig. 62), while the right screws the male blade as near home as it will go, and then makes numerous alternate turns of the screw, one turn out and one in, somewhat rapidly: this movement will work the impacted débris out of the female blade on each side of the narrow male blade. This proceeding is practicable with a flat-bladed lithotrite in which the male blade is narrower than the female, and it is one of the important purposes contemplated by the construction described, and forms one of the advantages of the instrument. The patient is now to rest quietly, making water in the recumbent position, as before, certainly during twenty-four hours, and no efforts are to be made to remove the results of the crushing by means of evacuating catheters or otherwise.

It is quite possible to remove by the flat-bladed lithotrite a large proportion, or even the whole, of the calculous débris, instead of permitting it to come away by the natural passage. As much as will pass easily between the blades should be brought away, but not more. The removal of large portions thus is not to be advised, as a rule, and for the following reasons. First, nothing is gained by so removing it; all the débris which can be impacted between the blades of an instrument being in a state of powder, or nearly so, can come away by the urethra easily without such aid. Secondly, the risk of over-distending and scratching the urethra, together with the serious consequences which these accidents often entail, is increased by this proceeding. Unless the bladder fails altogether to expel the débris, mechanical methods of withdrawing it are better dispensed with. Thirdly, the impaction of fragments in the urethra is subsequently much more likely to take place, if any laceration of the canal has been occasioned by withdrawing débris. Indeed troublesome impaction of fragments does not very often occur unless the urethra has been previously injured in some way.*

The succeeding sittings may usually follow at intervals

---

* Sir B. Brodie writes on this subject as follows:—"There are, however, some very grave objections to this mode of proceeding. The withdrawing of the forceps, if much loaded with calculous matter, stretches the urethra beyond its natural diameter, and, in so doing, not only gives the patient much pain at the time, but renders him liable to rigors afterwards; secondly, in four instances in which I had adopted this practice the urethra was torn, and an infiltration of urine into the surrounding tissues, followed by urinary abscess, was the consequence. Two of these patients in whom the mischief produced was deep in the perineum, died, notwithstanding the abscesses having been freely opened as soon as they were detected."—Med. Chir. Trans., vol. xxxviii. p. 175. Notes on Lithotrity.

In relation to the occurrence of infiltration of urine, and abscess after Lithotrity, Mr. Charles Hawkins thus expresses himself:—"He believed this accident might be entirely avoided, if the operation of crushing be performed with the lithotrite,—that is, if the operator is satisfied with crushing the stone, and not attempting to withdraw the fragments between the beaks of the instrument. He believed this accident never occurred except where the urethra had been lacerated with a piece of stone during the withdrawal of the instrument; then impaction of a fragment led to the results which the preparations exhibit; but where the urethra has not been lacerated, impaction is of little importance, and no dangerous symptoms are likely to result from such an occurrence. . . . . Since no attempts have been made to remove fragments from the bladder in the instrument, he had met with no such accident. . . . . As far as of from two to three or four days, unless difficulties have arisen; and the kind of instrument employed must depend on the size of the fragments we have to deal with, and these, of course, will depend on the original size and texture of the stone. If there are now many small fragments remaining in the bladder, but too large to pass, a condition which may exist after two or three crushings, it will be advisable to employ the lithotrite with a wide male blade (fig. 53), but constructed in all other respects similarly to that last used. With such an instrument it is scarcely possible to fail of picking up small fragments on each time of opening and closing, and on each crushing these will be granulated by the action of its flat blades; while not only the right and left incline, but the right and left horizontal positions, will be advantageously available in its use. When the fragments are small, it is not necessary always to screw up the male blade in order to crush them; it suffices simply to press it closely home by manual power, a method adopted by some. The screw, however, is smoother in its action, admits of no jerk or concussion, and I prefer it on this account. If a fragment falls between the blades which the scale upon the sliding-rod indicates to be too large for the power of this instrument, it has only to be rejected, and smaller ones found and crushed. In two minutes much granulated matter will have been made by the application of this instrument to the smaller fragments, and this may be safely left for nature to expel. These processes are now to be conducted

his experience went, it was not necessary to attempt the removal of stone in the scoop-lithotrite. If the stone is *well crushed*, it may be left to nature for the bladder to be evacuated of the fragments, or where there was a difficulty in passing them, he had removed much by means of washing out the bladder." . . . .—Path. Trans., Part I. of vol. iii. 1850, pp. 123–4.

on the principles laid down, and repeated until the stone has nearly disappeared.

7. Removal of the last fragments.—This is an extremely important crisis in the operation, and one which it is important not to neglect. It sometimes demands more skill and nicer manipulative power, than any other part of it.

Supposing that after four, five, or six sittings, or more if the size of the calculus has demanded them, it has become obvious that very little calculous matter remains in the bladder, we have now to take care that the last fragments are entirely removed. As long as any remain, there will almost invariably be some pain in passing water, especially at the close of the act, while the urine may be cloudy and often tinged with blood, and quick movements of the body give pain. As long as these symptoms persist we may suspect that some portions still remain behind, and these must be found. The best method of proceeding is to introduce, as before, the lithotrite with plain blades, taking care to have only a small quantity of water in the bladder, say about two or three ounces. The best form for the purpose is that in which both the blades are short and wide, and their ends not in any degree tending to a point.

FIG. 68.

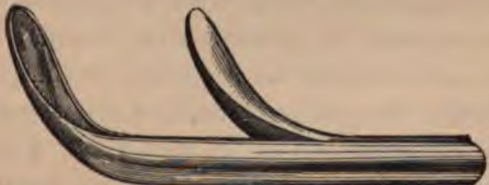


Fig. 68. Lithotrite with short and wide plain blades for small fragments.

The form represented by fig. 68 is greatly preferable for this purpose to that of fig. 52, p. 163. If by the ordinary positions of the instrument we encounter no fragment, the handle must be a little depressed between the patient's thighs, as directed for the reversed positions at pages 190–1, and these positions of the blades employed. It will now be seen why the pointed blades are objectionable, as being more likely to irritate the floor of the bladder, and less likely to catch the fragment. A careful search in the right and left reversed incline, and in the reversed vertical position, will generally discover its object; if not, the patient's pelvis is to be raised about four inches, that is, to the exceptional position, when with care and perseverance the fragment will be caught and crushed. This sitting requires sometimes a little longer time than usual; it should never extend, however, beyond three or four minutes. If not successful, then it is better to wait a few days, and to try on the next occasion a slight deviation in the position of the patient, as from the back to reclining a little on either side; and the effect of an ounce more or less water in the bladder than before used should be observed.

I have before alluded to the facility which the cylindrical handle affords for the most delicate sounding, or searching for these tiny fragments; and also to the ease with which a practised hand may demonstrate the practicability of producing an audible "click" from a fragment no larger than a pepper-corn. A gentle but very rapid half-turn of the instrument between the finger and thumb will give a blow sufficient to produce a click, which three or four persons standing over the patient may hear. I have often afforded the proof of this, by first producing the "click" in question, and then instantly seizing and removing the little fragment unbroken, since it is mostly too small to produce any inconvenience in its transit through the urethra, and placing it in the hand of the bystander, who is usually surprised to see how minute a body may thus be detected and removed.

It is at this period of the case that the cylindrical handle of the lithotrite becomes of great value. Supposing the instrument to have been placed in the bladder, and that the blades are in the reversed position, these should be brought up close to the neck of the bladder, by withdrawing the lithotrite until they are felt to rest lightly against the internal meatus. Now, holding the handle between the index finger and thumb, several gentle but quick semi-rotations of the instrument on its axis should be made in perfect silence, and if any fragment is there, a slight click is easily obtained, or the contact felt. All that it is necessary to do, is to open at this spot the blades of the lithotrite, by pushing the female blade towards the centre of the bladder, for about half an inch or so, and then, on closing, almost certainly the fragment is included. You then turn upwards the blades and crush.

It has been supposed to be sometimes useful to employ an instrument of similar form to the preceding, but with a small channel traversing the male blade, and entire length of the sliding rod. In this way, without removing the instrument from the bladder, we may add to or diminish the fluid contents of the bladder, and thus search for the fragment under different conditions of the viscus. I succeeded recently with an exceedingly troublesome fragment which had eluded me at two somewhat prolonged sittings previously, by using this instrument in the following manner:—The patient was seventy-five years old, had a very large prostate and a greatly diseased bladder, with phosphatic calculus, all of which had been removed except this small bit. I introduced the hollow lithotrite, the patient standing and leaning forward, opened the blades about an inch, and then allowed the urine to flow out altogether, through the hollow male blade: on closing the blades (that is, *drawing down the female blade* upon the male, not raising the male blade, an important distinction), I found and crushed the missing fragment. At this time, however, I did not possess my present lithotrite, which has rendered any resort to the instrument in question unnecessary.

There was another resource which was a favourite one with Civiale, to find a last fragment not yet expelled, viz., the employment of the "trilabe," or "pince à trois branches," one of the earliest instruments designed in the history of Lithotrity. It (see fig 69) consists of a straight cylindrical sheath, containing a stem, having three branches at its vesical end, which expand on pushing them outwards, and approach each other closely on being drawn in: in the centre is a fourth branch with a rough head, which can be rotated or otherwise moved independently of the rest. Civiale had an inventor's "*penchant*" for this instrument, and although for every one else it had long been obsolete, he was fond of showing it and using it occasionally. This feeling shows itself even in his posthumous work on Lithotrity, in which it is still referred to

FIG. 69.

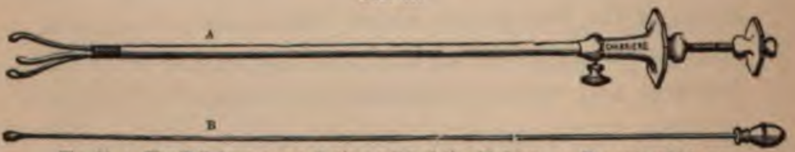


Fig. 69. A. The Trilabe, open, as in the cavity of the bladder. B. The axis which perforates the centre of the instrument, its roughened head occupying the centre of the space between the open blades. Here it is shown separately from the rest of the instrument.

with obvious satisfaction.* His directions for its employment may be expressed as follows. To search for a final fragment, introduce this instrument into the bladder, which should contain about five or six ounces of water; expand the branches a little, and rotate them once or twice by way of searching: meantime the urine slowly runs off through the instrument until the three blades are surrounded on all sides by the walls of the bladder, a cavity of a pyramidal form existing between them. Into this cavity the fragment is almost certainly brought: it may be felt for there by the central branch. The branches are now slowly withdrawn into the stem, the cavity slowly contracts in size, and the fragment is found in its centre, and will be crushed either by them as they finally close, or by rotating the central one.

Nevertheless, while it is a rule in searching for minute fragments at the end of a case to employ a small and light instrument with a small quantity only of urine present, there are some very rare cases in which there is reason to believe a fragment or two may still remain behind, although none has been so detected. It may be from peculiar configuration of the prostate, or that in some bladders the interstices are so numerous from fasciculated muscular coats, that small fragments become engaged in them, and evade all search by that means.

Until a very recent period it has been the custom, and I believe it still is so with some operators, to use large injections of warm water for the purpose of washing out the remaining fragment or fragments. Indeed, this practice formerly was regarded as an essential part of each sitting in Lithotrity. Not only was a preliminary injection made, to ensure the presence of a specific quantity of fluid for the lithotrite to work in, but, after the removal of the instrument, the patient was commonly placed in the upright position, and several syringefuls of water were briskly injected and encouraged to flow out with force, to remove the débris. I soon observed how remarkably small were the results obtained by this process: few who have not had the opportunity of witnessing the practice would believe how curiously barren such proceedings were in proportion to the disturbance, not to say pain, produced. A bladder, for example, is known to contain much débris, for a large crushing has just taken place, nevertheless nothing more than a mere bit or two will often appear, although a large evacuating catheter has been introduced, and several jets have passed through it. A day or two afterwards, perhaps, when the patient has recovered the irritation set up by these prolonged manipulations, a quantity of small fragments passes easily enough by the natural efforts. I therefore tried to dispense with these evacuating injections altogether, and with so satisfactory an effect that I have never resumed them, in that fashion at least, in a single instance. Any artificial mode which I have employed, of removing fragments, over and above the use of the lithotrite, has been, for some years, solely that which is offered by means of Mr. Clover's evacuating apparatus; which shall be described in due course.

---

* Op. cit. p. 103.

All the rest of the apparatus, including syringes, double-current catheters of every description, as well as those ingeniously designed current-propellers in manifold variety, worked by the endless screw and otherwise, which French mechanical genius has called into existence, must now be regarded not only as useless but as positively mischievous machines. All that involves prolonged contact of large instruments with the bladder and urethra is, *pro tanto*, a source of pain and even of danger. Again and again it it is necessary to enunciate, that nothing but evil can arise from unnecessary meddling with the neck of the bladder and with the urethra; and many a life has been sacrificed by the gratuitous employment of instruments, or by the injuries caused by unnecessarily dragging forth fragments of stone by mechanical means. With these preliminary remarks, I shall now merely describe briefly the methods which have been employed for the removal by injection of water, of fragments from the bladder, and which may be useful to a certain extent in exceptional cases of atony and enlarged prostate; but which are nevertheless inferior to the apparatus already alluded to of Mr. Clover.

FIG. 70. FIG. 71.

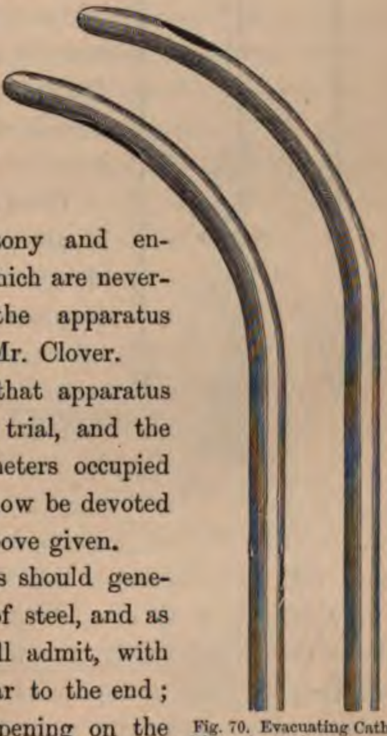


Fig. 70. Evacuating Catheter with oval opening on concave side.
Fig. 71. Ditto, on convex side.

In my first edition that apparatus was then only under trial, and the use of evacuating catheters occupied more space than will now be devoted to it, for the reasons above given.

Evacuating catheters should generally be of silver, or of steel, and as large as the urethra will admit, with a large oval orifice near to the end; one should have an opening on the convex, and another on the concave

FIG. 72.

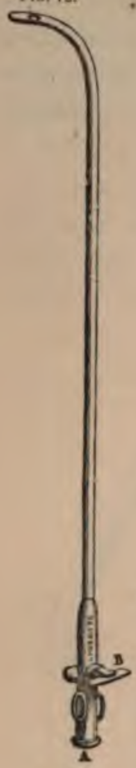


FIG. 73.

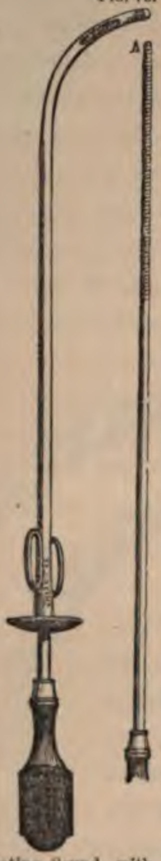


Fig. 72. Evacuating Sound, with lateral apertures. A and B, stop-cock and nozzle for injecting.
Fig. 73. Ditto, mounted on metal-jointed stylet. A, stylet removed.

aspect of the curve (figs. 70 and 71); they may also be placed laterally (fig. 72). There should be a flexible gum elastic or metal-jointed stylet, perfectly filling the interior, at all events at the lower end where the opening is situated, that the instrument may pass smoothly into the bladder (fig. 73, A). It may be provided with a stop-cock or not (B), or the syringe may have a movable piece with stop-cock fitting both the evacuating catheters, in which case it is unnecessary.

When the evacuating catheter is about to be withdrawn, it should not be forgotten that a fragment may be engaged in the orifice and be protruding from it, an occurrence by no means unfrequent. This is made obvious by the light resistance experienced when the fragment touches the neck of the bladder, and the patient will probably feel a little pain. If the resistance is very slight, it is only necessary to withdraw the catheter slowly and gently, and no harm will result; by humouring it, and giving plenty of time, injury may generally be avoided, and no pain will be occasioned. If, on the contrary, the resistance is obvious, a jointed metal stylet (fig. 73, A), which fits the catheter, being pushed home, the fragment will either be crushed or disengaged, probably the former; if the latter only is desired, a current of water inwards will probably effect the object. The attempt to crush in this manner is best accomplished when the evacuating catheter is of steel.

Double-current catheters have been spoken of, but they admit very little room for the passing outward of fragments, because a portion of the calibre of the instrument is occupied by a channel for the inflowing current. One of the best forms, if such a catheter is ever required [I never use one for any purpose whatever], is that made by Mr. Coxeter. Fig. 74 represents a catheter of the old construction, which throws the current upwards and forwards. Fig. 75 represents the new one, which directs it downwards, so as to stir up the detritus lying at the

FIG. 74.

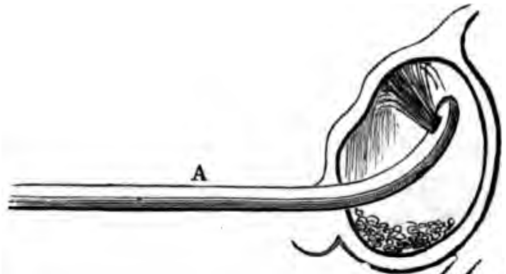


FIG. 75.

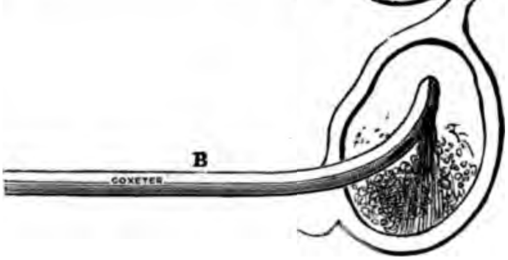


Fig. 74. Double-current Catheter, of ordinary construction, in action in the cavity of the bladder.
Fig. 75. Coxeter's instrument.

FIG. 76.

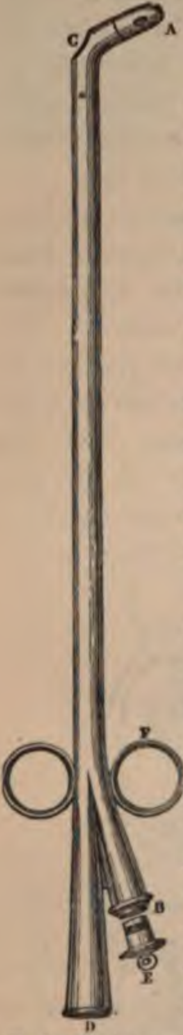


Fig. 76. Mercier's double Catheter. A, Aperture by which the water enters the bladder. B, Aperture for injecting. C, Aperture for return of water from the bladder. D, Aperture for exit.

bottom of the bladder, and thus promote their expulsion with the outflowing stream.

Mercier, of Paris, uses one of the form ("coudée") he prefers, in which the orifice is favourably situated for the entrance of débris, although unsafely placed for passing and repassing the neck of the bladder, which it is certainly calculated to irritate (fig 76). An instrument of Maisonneuve, which has been termed the "Lithéxère," may be named, but certainly not for any purpose of commendation It consists of a large catheter, in the interior of which an endless screw rotates, and withdraws by its action portions of débris from the bladder.*

I shall now describe the apparatus referred to as designed by Mr. Clover, for the removal of débris from an atonied bladder, or in other circumstances where it is deemed desirable to act in this manner. It consists of a ten-ounce india-rubber bottle, into the neck of which is fitted a glass cylinder with a perforation at the end, the size of a No. 14 catheter, together with a series of evacuating catheters. The catheters are of various forms and sizes, each having a transverse plate where the rings usually are, and a conical collar, to ensure accuracy of fit to the glass cylinder, into which they project one inch.

---

* Gaz. des Hopitaux. Nov. 10, 1864.

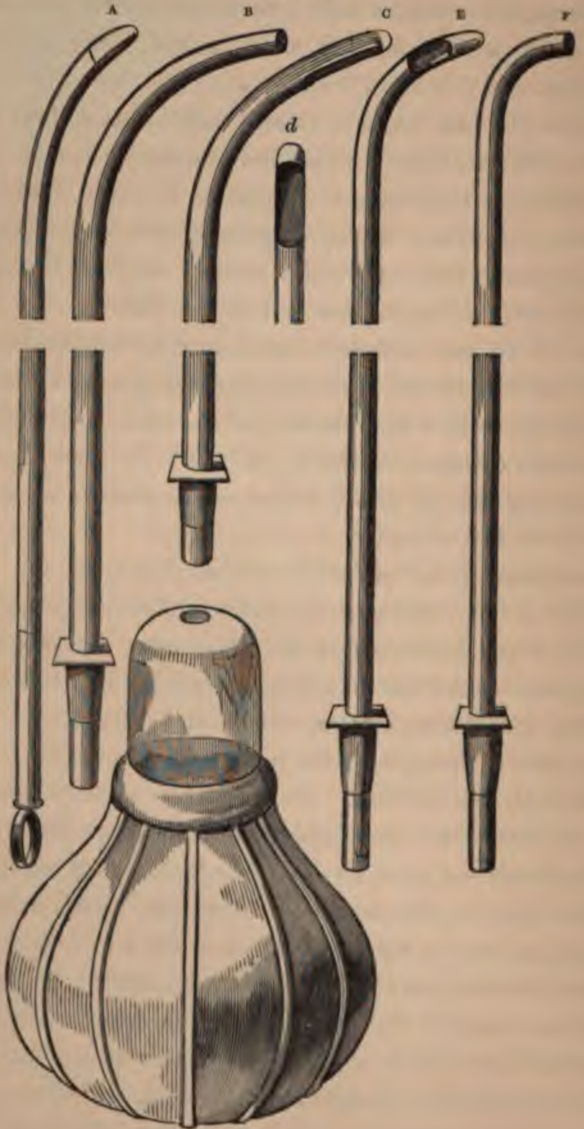
They should be as large as the urethra will admit, made of thin silver, and provided with gum-elastic stylets. In some cases, the best kind is that which is cut transversely at the distal end (see fig. 77 F).

Fragments are, perhaps, more easily drawn into this catheter than into those which have lateral apertures, since the route they must take in the latter is more circuitous. There is very little difficulty in passing such an instrument if the stylet is furnished with a conical silver end, projecting half an inch beyond the end of the catheter.

One of the best catheters has an oval opening at the side, which should extend half through the thickness of the instrument, so that the diameter of the opening is equal to that of the catheter itself (fig. 77, E). For special cases, the opening may be placed either on the concave or convex side of the instrument.

In operating, the patient is to be placed on his back, with his pelvis elevated in the ordinary Lithotrity position; that is, some inches above his shoulders. In employing the apparatus, let the following instructions be followed:—Having passed the catheter, remove the stylet, and let the urine escape, then attach the india-rubber bottle previously filled with warm water. Compress the elastic bottle till the resistance of the bladder is felt, then gently press on the catheter so that its internal opening may occupy the lowest part of the bladder; allow the elastic bottle to expand as long as the water comes freely away, but if the stream diminishes or stops, reverse the current by pressing the bottle, and if this will not effect a free outflow, inject a little more water, and move the end of the catheter a little towards the centre of the bladder. If the calculus has been sufficiently broken up, several pieces will come

Fig. 77.



away at once, but when they are rather large, they are apt to block up the tube, and the current must be changed frequently to enable them to come away. The fragments having passed through the catheter, fall into the glass vessel, and cannot return when the current is sent inward. As soon as the outward current is seen to slacken, press the bottle, to force back the obstruction, for whether the diminished stream depends upon too many pieces, or one large piece, or from contact with mucous membrane, it is useless to try to empty the bladder further, for no fragments will be removed by a languid outflow. The inward current should be slow, the outward current should be rapid, and the process may be repeated ten or twelve times at a sitting. When only a few small fragments remain, the patient may lean forward against a table, so as to make the orifice of the bladder its lowest part whilst the catheter (fig. 77, C and D) is used.

It is scarcely necessary to remark, that before using this instrument on the living subject, it is desirable to practise with it by extracting broken stone or coal from a basin of water. The foregoing embodies Mr. Clover's own directions for the use of this instrument. Having used it very frequently, I would add that it is necessary to use all such apparatus with extreme gentleness, and I prefer to do without it, if possible, as its employment is quite as irritating as a sitting with the lithotrite. Repeated injections which alter rapidly and considerably the size of the bladder, are always irritating to that organ. Mr. Clover states that he has seen me use his apparatus some sixty or seventy times, and I must have used it at least two or three hundred times, so that I have a tolerably fair acquaintance with the instrument and with its capabilities.

Treatment following the sitting.—Much might be said in reference to this subject, if every accident possible to occur were to be considered and provided against. Those of the most importance will be considered here: some have been already slightly alluded to.

The principle aim of modern Lithotrity, as by this time will have become obvious, is to crush the stone without risk, not only of danger from the operation itself, but from the occurrence of serious difficulties afterwards: for many of these the manner of performing the operation is answerable. Formerly, a case was rarely conducted to its termination without some grave troubles from the impaction of fragments in the urethra. Now, this is a rare occurrence. Fragments are rarely impacted unless they are sharp and angular or the walls of the urethra have been lacerated. If care is taken that the patient passes his water, at every act of micturition if possible, in the supine position, for a day or two after each of the first two or three sittings; and if the operator is fairly successful in pulverizing or granulating the stone subsequently, not much risk of trouble will arise on this head. After a short sojourn in the bladder the angular fragments become water-worn, their points and edges are rubbed down, and they pass without difficulty.

Impaction of fragments.—Supposing, however, a fragment to have become arrested in the urethra, and the patient to be able nevertheless to relieve his bladder in a diminished stream, the pressure of the urine usually brings it forward in a few hours to the orifice, or near to it. If not, an attempt may be made to remove it, and with a well-made urethral forceps this may be accomplished almost at any depth. The long stems of the forceps should be slightly curved so as to cross each other; in this way an instrument may be constructed seven inches, or more, in length (not including the rings), the blades of which will open sufficiently to seize a fragment two or three eighths of an inch in diameter, without overstretching the meatus externus. A drawing of one, made for me by Messrs. Weiss and Son, is annexed (fig. 78). They are 8½ inches long, and will pass to the neck of the bladder in most individuals. Furthermore, the ends of the blades should not be pointed, should not meet each other, and should be slightly scoop-shaped. With this instrument I have extracted large fragments with great ease. All that is necessary for this purpose is to commence with a fair firm hold on the fragment, and then to give plenty of time to the withdrawal, extracting as slowly and gently as possible. In this way it is remarkable how large and sharp a fragment may be safely removed, whereas by force the urethra is lacerated, and the extraction is rendered much more difficult. Sometimes it is necessary to return to the bladder a fragment situated in the prostatic or membranous portions; but all on this side the last-named spot should certainly be extracted. To effect the former object, a large gum-elastic bougie usually suffices; if not, a large silver catheter, the end of which is cut off, and the opening

FIG. 78.

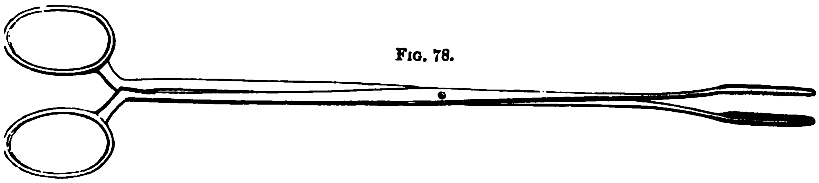


Fig. 78. The long urethral Forceps described. They are drawn of exactly half the length of the original.

accurately fitted with an olive-shaped knob attached to a stylet, is passed down until the fragment is reached; the stylet is then withdrawn, the rim of the opening at the end of the catheter surrounds the fragment, and will remove it safely into the cavity on making pressure: sometimes a stream of water forcibly injected will displace it more readily than the instrument. Some operators prefer to extract with a small three-bladed forceps ("*pince à trois branches*") (fig. 69, p. 206). The small urethral lithotrite (fig. 79) is used by others, but the simplest instrument, and in my opinion the most efficient, since it is much more immediately under the guidance of the hand than those which are more complicated, is the long urethral forceps described above. The employment of small crushing instruments in the urethra requires great care and extreme delicacy of manipulation, or more harm than good may be done; and should not be resorted to unless the forceps have really failed. A long cuvette, well constructed, is a very useful aid; and is in some circumstances the most efficient means which can be employed (fig. 80).

FIG. 79.

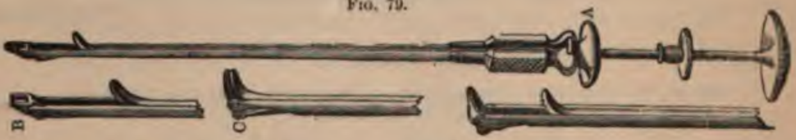


Fig. 79. A small urethral Lithotrite, the female blade of which can be depressed by turning the disc A to the left. After insinuating it beyond the fragment, it can be raised by turning the disc to the right, when, by means of the male blade, the fragment can be crushed. B, female blade depressed. C, the blades closed.

It is said to be necessary occasionally, but very rarely, to cut down upon an impacted fragment, either in the perineum or near to the meatus externus. If it remains there, obstructing micturition, or if it is lodged in the soft parts surrounding the urethra, which is apt to happen in or about the membranous portion, causing much disturbance, or threatening abscess, it might be removed by incision. Up to the present time (1870) I have never had occasion to do this; although occasionally I have had to divide the inferior angle of the external meatus to set free an unusually large piece, which was arrested there. The meatus is sometimes preternaturally small, and requires to be divided; if so, this should be done at the outset of the case.

FIG. 80.

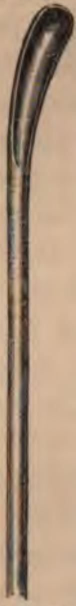


Fig. 80. A cuvette of the natural size.

Removal of foreign bodies.—With the proceedings for removing fragments of stone, the removal of foreign bodies introduced into the bladder is closely allied. Few of these can be crushed; almost all must be removed either entire, or after division into one or two pieces when necessary. It is more common to meet with them in the female than in the male bladder, always excepting for the latter sex, fragments of bougies and catheters which, especially when made of that treacherous material the gutta-percha of commerce, are liable to break, and thus to occasion this accident. Pieces of stick, straw, and sealing-wax are occasionally introduced. I removed a considerable portion of the last-named successfully by lithotomy some years ago, not finding by experiment that sealing-wax was very friable at the temperature of the body, and so not performing lithotrity. Nevertheless, a similar case has been so dealt with in Paris since, and with good results.

In the removal of many of the foreign bodies referred to, the French makers have designed several ingenious instruments. Figs. 81 and 82 represent those which are adapted for laying hold of a portion of bougie, flexible and inflexible, respectively, and bringing it away safely. The instrument (fig. 81) is introduced into the bladder with its extremity in the condition shown at *a*, a hook is then made to issue from it and search for the flexible bougie by moving the handle B: the bougie being seized, it is forced into a position which coincides with that of the long axis of the instrument, as seen at *b*, which insures its safe withdrawal. Fig. 82 is another instrument which similarly deals with a portion of metallic catheter or bougie. Figs. 83 and 84 represent instruments ingeniously contrived for a similar purpose in relation to the female bladder, particularly for the removal of hair pins, or other pieces of wire, so that it is scarcely foreign to the purpose to mention them, especially as it is by no means impossible that they might be useful for the other sex. Fig. 83 acts by seizing, folding, and drawing a wire into a straight tube. Fig. 84 removes them without folding, but by simply seizing and adjusting them to the long axis of the instrument.

I have removed a hair pin from the male bladder in a man aged 65 years, whom I saw in consultation with Mr. R. W. Dunn, by seizing the end of the pin with the blades of a lithotrite and slowly withdrawing it, so that the pin issued as an almost straight wire, five inches long. No bad symptom followed, and the patient went about as usual the next day.* This is practicable only with slender and flexible hair pins; but some are made of stout wire

---

* *Lancet*, Nov. 28, 1863.

Fig. 81.

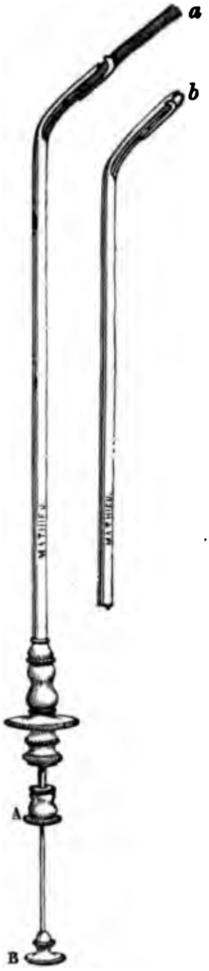
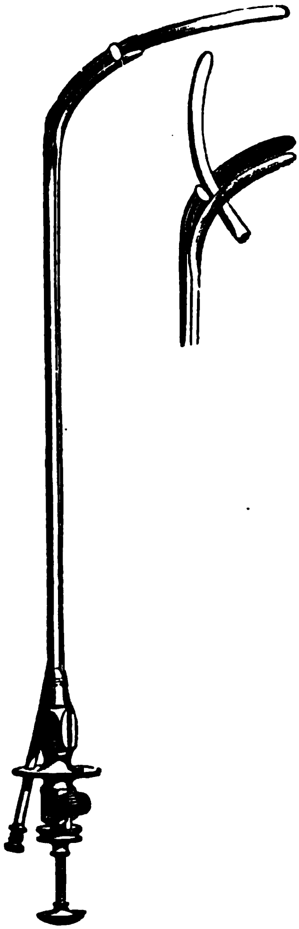


Fig. 82.



which cannot be readily unbent,* and which, indeed, are too powerful for the instrument delineated as fig. 83, which was made in Paris, as I once tested in the case of a

---

* A common pin was removed from a young man *in three portions* by Lithotrity. It was the nucleus to a phosphatic stone. Cat. of Calculi, Royal College of Surgeons. Pt. 1. pl. xii. fig. 14. In the Museum H.a. 14.

There are several examples of pins, bodkins, &c., forming the nuclei of stones in the bladder of women, in the Royal College of Surgeons. *See* H.a. 1, H.a. 2, H.a. 7, H.a. 11, and pp. 127—30 of Pt. 2 of Cat. of Calculi.

FIG. 83.

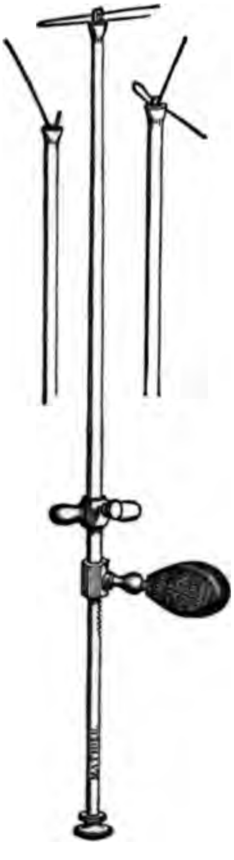
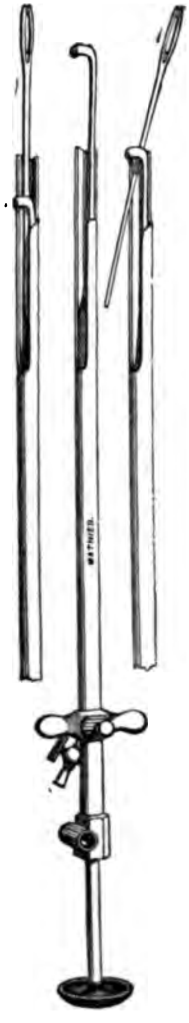


FIG. 84.



female patient. Messrs. Weiss, on that occasion, constructed a fac-simile of that instrument, but much more powerful, and with this I could draw any hair pin into the tube of exit. The girl supplied me with a hair pin similar to that which she had passed into her bladder, and thus I was enabled to discover the character of the foreign body to be dealt with, and to learn by experiment that the French instrument was quite powerless to remove it.

Complications occurring in the course of the operation. —It is not my intention to dwell at length on complications frequently arising in connection with Lithotrity, which require treatment on those general principles which it must be assumed are well understood by any one likely to practise the operation. Some remarks only will be made on those affections which directly result from operations performed on the calculous subject. They may be enumerated as follows:—Fever, inflammation of the bladder or of the prostate, orchitis, hæmorrhage, and retention of urine. With regard to the influence which certain complications, affecting the patient prior to operation, should have in determining what method of relieving him is to be adopted, such as extreme age, debility, renal disease, diseased bladder, enlarged prostate, stricture of the urethra, peculiarities in the stone itself, that will be discussed in Chapter XIV., which is devoted to a consideration of the numerous circumstances which should guide the judgment in relation to each individual case which comes before us.

Fever.—It is by no means uncommon, although it is exceptional, that a sitting is followed by a rigor, rapidly succeeded by hot and dry skin, and subsequently by sweating. At the same time there are thirst, an accelerated pulse, and augmented temperature. Pains in the head or back, or in all parts of the body, not unfrequently occur also. This is commonly known as an attack of fever, or of "urethral fever;" this peculiar group of symptoms being associated with some lesion, however slight, of the urethra. The attack varies greatly in intensity; it may commence in the faintest chill, or in a rigor of great severity, the subsequent phenomena generally corresponding to the initial one. In nine cases out of ten it is not of serious import; it renders the patient temporarily weak, and prolongs the treatment by rendering some postponement of the next sitting desirable. Having occurred once, it should be anticipated at the next crushing by keeping the patient warm at the time, wrapping him up well, and afterwards applying hot bottles to the feet, and giving some warm drink, as hot tea, or a little wine and water, if preferred. A moderate dose of opium is, perhaps, the most useful prophylactic; quinine appears to have little influence in preventing the attack. A drop of the tincture of aconite given at the time, and repeated in two or three hours, has been said to prevent rigors; but I cannot endorse the observation, for it is very difficult to judge of the effect of any single agent in these circumstances. That one in which I have the greatest faith, as a preventive, is the surgeon's ability to operate with ease, gentleness, and rapidity, so as to hurt the urethra as little as possible.

Inflammation of the Bladder, Prostate, or Testicle.—When the attack is very severe, it may announce some local affection, the onset of cystitis, or some renal implication, or inflammation of the testicle, although it may still be only severe constitutional disturbance resulting from the operation, and not producing any local inflammation; in this case the fever is more likely to continue or become intermitting. If pain above the pubes, or at the neck of the bladder, and frequent desires to make water are experienced; or, on the other hand, should severe pains in the loins and sickness occur,—counter-irritation to the suprapubic region, or to the loins, respectively, is of great service. I know of no better form for these cases than the repeated application of hot linseed poultices, sprinkled with mustard. Hot hip-baths, demulcent drinks, diaphoretic regimen, and mild nutriment, form the main elements of treatment; opium, if necessary, to relieve pain. The decoction of *Triticum repens*, from a pint to a pint and a half daily, is particularly useful. When the cystitis becomes more chronic, and much pus and mucus are mixed with the urine, the bladder may sometimes be washed out daily, and another crushing performed as soon as possible, since pulverizing some of the larger fragments may ameliorate the condition of the bladder sooner than any other treatment. In orchitis, which rarely occurs, fomentation and rest are necessary, but no lowering measures are to be adopted. Of course, the next sitting must be postponed until it is better, and be a short one, and more than usual care be taken in manipulating.

Hæmorrhage.—This rarely occurs; a little bleeding sometimes follows the application of instruments, and may even continue for a day or two—but this is exceptional. I once saw severe hæmorrhage occur from the bladder, not from the urethra, probably from peculiarity of constitution, after a short sitting conducted with great care; the bleeding continued in spite of all treatment until the patient's death, which occurred in the course of a week. At the autopsy no sign of injury was discovered by the most rigorous examination, either in the tissues of the bladder or in the prostate; but the whole mucous membrane was greatly congested. The patient had been in the habit, while the subject of stone, of losing blood freely from the bladder after exercise even of a very moderate kind. The usual treatment of vesical hæmorrhage should be adopted in these cases, consisting in rest, elevation of the pelvis, cold, with or without ice, ice in small pieces in the rectum, even injections of ice-water, or iced solution of matico, if the manipulation does not excite fresh bleeding. The tying-in of a soft vulcanized catheter may or may not be advantageous, which experiment alone can determine. As a rule, all mechanical expedients are to be postponed, until absolute quiet and cold have proved inadequate to obtain subsidence of the hæmorrhage; since it is so much more easy to excite fresh bleeding by such means than to check it; and further attempts to deal with the stone should be postponed until the symptoms have ceased, when the course to be pursued is a question for very grave consideration. The subject of hæmorrhage in all its bearings is a very large one, and has been treated fully elsewhere. A brief synopsis will suffice here.* In a case, recently under my care, the disposition to bleed manifested itself after the first sitting or two, but it gradually got less as the end of the treatment approached, and the bladder appeared to regain a healthier tone. It was sufficient, however, at the outset to occasion anxiety, but the case terminated admirably well.

Chronic Retention of Urine.—There is one condition which must always be closely looked for after Lithotrity, especially in elderly subjects. It is the occurrence of retention of urine after a sitting. It may occur very insidiously, occasioning great discomfort and even constitutional symptoms, before either the patient or the surgeon is aware of the cause. The bladder appears to be temporarily atonied, it becomes full and the surplus runs over, and as the urine appears in the ordinary quantity of health, the distension of the bladder is easily overlooked. It is not due to impaction of fragments in the neck of the bladder, but apparently in part to defective power in the organ, resulting from the operation; and in part to swelling of the urethra, or of the prostate beneath it; mostly, but not always, the natural power is speedily regained, but, until it is so, the catheter must be introduced twice a day, or more frequently if necessary, as in all cases where this condition exists from other causes.

---

* Diseases of the Prostate. By the Author. Lond. 1868, p. 206, et seq.

As to the time during which the recumbent position should be retained after each sitting, and to the amount of confinement within doors subsequently, it is impossible to lay down any rules which can be applicable to all cases. In each it must depend on the liability to local and constitutional irritability which each case exhibits. While in some cases, where the stone is small and the patient has good health and little local excitability, strict confinement to the house is not desirable, in others it has been necessary for a period of some weeks. Often, however, air and some very gentle exercise can be taken between each sitting, with advantage to the patient.

CHLOROFORM.—There is a point of some importance indirectly connected with the operation of Lithotrity on which difference of opinion exists.

I refer to the use of chloroform during the sitting; and shall very briefly consider how the condition of anæsthesia affects the operation, because it is quite evident from the manner in which the preference to perform Lithotrity without chloroform has been viewed by some, that the grounds for that preference have been misapprehended.

First, then, let it be premised that there is no reason why the patient should not escape any degree of pain and uneasiness which attend the crushing of a stone if he be very nervous or susceptible. In these circumstances, it is no doubt better on the whole that he should be spared the excitement and the shock, which might be considerable in his temperament.

But the pain arising from Lithotrity, properly performed, is really not much. It is uneasiness rather than pain; and as a sitting is rarely longer than one or two minutes, the demand on a patient's fortitude is not very considerable.

Now the only advantage in not employing chloroform with which I am acquainted may be thus explained. There are certain circumstances, over which we have no control, and of which we have little knowledge, that render calculous subjects more sensitive on some days than others. Ordinarily the patient may bear the sitting without a murmur, and after it is over state that he has had little to complain of. But on commencing to perform it on another day, although the operator proceeds with the same care and facility as usual, the patient complains much as soon as the lithotrite has entered the bladder: its slightest movements aggravate the pain, and any attempt to proceed evidently causes him much suffering. In such circumstances nature's plain indication should be followed, the instrument should be withdrawn at once, and the sitting postponed to another day. If it be persisted with in spite of this warning, a rigor may follow, and some cystitis will perhaps, be set up. It is needless to say that had chloroform been taken in such a case, nature's voice must have remained silent, and the crushing would have taken place, with questionable benefit, probably with risk. We do not know how, or why, this undue excitability existed; no other signs might be present, cautioning the surgeon not to operate that day; but the sign of hyper-sensibility is sufficient, and it is well if the opportunity of being warned is afforded.

The condition thus described is, it may be admitted, not frequently so marked as in the instance cited, but it is very often present in a less degree. Bearing this in mind, it is always wise to shorten any sitting, or at once desist, if manipulation becomes more than usually painful. Suffering is always a sign, in these cases, of some evil which it is desirable to avoid; it suggests increased care, if possible, or a shorter term, and it is well to act in accordance with it.

This is the benefit, and all the benefit, which I believe attaches to the absence of anæsthesia. Each case, in relation to this matter, must be judged by its own peculiar requirements. My own practice is, to use it without hesitation when it appears to me to be necessary, or when it is much desired by the patient, and this happens, perhaps, in one case out of ten. As before said, Lithotrity, in the majority of instances, ought not to occasion much suffering; and if the surgeon habituates himself to operate without an anæsthetic, watching for any sign of uneasiness on the part of his patient, he acquires almost unconsciously a mode of manipulating which is delicate, careful, and extremely unlikely to fatigue or irritate the bladder.

It will now be clear how completely the advantages of consciousness during Lithotrity have been overlooked by those who have regarded them as consisting in the operator's ability to ascertain, by his patient's expression of suffering, when the coats of the bladder are seized instead of the stone! Slender, indeed, must be the chance of that patient's recovery, whose consciousness is needed to impart such information to his surgeon.

LITHOTRITY IN CHILDREN.—Lithotrity can be applied to patients of any age; but there are some difficulties in its employment in the cases of children which those of adults do not generally present. Regarding Lithotrity in the abstract, without reference to age, let us call to mind what are the conditions most favourable to success.

First. A fairly capacious urethra.

Secondly. A bladder displaying moderate tonicity, but not excessively irritable.

Now, neither of these two conditions exists in children, and their absence is the source of most of the difficulties in question.

1. The urethra of the child, say from three to seven, or eight, years, is exceedingly small, and it is during this period of life that half the cases below puberty occur. To crush a stone at this age it is, therefore, necessary to employ a very small lithotrite. Hence, none but small stones are amenable to its action, unless the sittings are numerous. For, in a small lithotrite, the blades must necessarily be short, otherwise they are liable to break; and short blades are incompetent to grasp any but small masses If used to break down piecemeal a stone of an inch diameter, the time consumed is considerable. Hence, in Paris, where only, Lithotrity has been largely employed

for children, ten, twelve, or more, sittings are common, and each sitting requires at least double the time which is necessary for an adult, from circumstances next to be alluded to. A case is on record there of a child nine years old, who, in the most able hands, was the subject of no less than seventy sittings.

2. The pyriform shape of the bladder, and its situation in the abdomen rather than in the pelvis, are unfavourable. There is no fixed area for operating as in the adult; no spot where the stone may almost certainly be found; no depression behind the prostate; and the viscus is often much distended and capacious; hence, there is extra expenditure of time in seeking the stone.

The form and situation of the bladder also favour the determination of fragments to the neck, when the patient is recumbent in the ordinary position. The organ is extremely excitable, contracting vigorously and continuously with very slight irritation. Hence, impaction of fragments in the urethra readily takes place after the stone has been crushed. It is common to encounter much difficulty from this cause; obstinate retention of urine not unfrequently resulting, which has sometimes to be relieved by cutting down on the fragment, and removing it through the perineum.

Furthermore, these young patients possess none of that self-command which so often conduces to the success of the proceeding in the adult; and chloroform must always be employed in their cases.

Incontinence of urine after Lithotrity in children is not a very uncommon result, although it generally disappears spontaneously in course of time.

If it is decided to operate in any given case, the

FIG. 85.

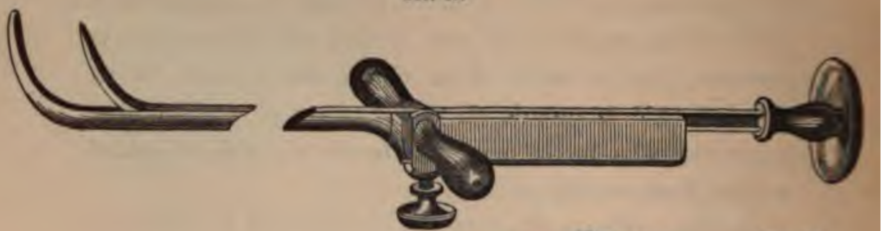


FIG. 86.

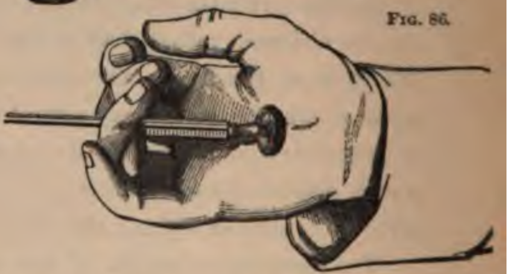


Fig. 85. A small Lithotrite without screw, for young children. Its size is about No. 5.
Fig. 86. The transverse bar is the base of support against which pressure by the hand crushes the stone.

urethra should be dilated on three or four occasions previously, the pelvis should be well elevated; and if the stone, when caught, proves to be no larger than a pea, it should be efficiently crushed at a single sitting, care being taken to granulate it thoroughly. Providing it is thus small, the proceeding is generally successful. The child should be confined strictly to bed, have plenty of demulcent drink, an opiate if much straining follows, and warm baths. In cases of my own, in which the stone was quite small, I have crushed it at a single sitting. Such a result must be regarded as a simpler and safer proceeding, probably, than Lithotomy. But where more than two or three sittings are necessary, the advantage of Lithotrity appears to be very doubtful. The instrument I used, in that and other cases, is one without a screw; the crushing power being obtained by simple pressure in the palm of the hand; and this is ample for the small concretions to which it is applicable. Fig. 85 represents the instrument, and fig. 86 the mode of applying it. But the usual form may equally be employed.

Boys, from nine to thirteen, are somewhat more promising subjects, but in them the same sources of difficulty exist, though in a less marked degree.

Dr. Guersant of Paris, surgeon to the Children's Hospital, reported twenty-one cases of children, on whom he practised Lithotrity, in which there were six deaths; "two," he states, "from the operation, and four from inter-current diseases." Besides these, three others were subsequently cut. Lithotomy in children, following unsuccessful Lithotrity, does not appear to be a promising operation: every one of the three died. It need hardly be added that English Lithotomy affords results incomparably better than these. The deaths to recoveries between the first and the fifth year are only one to thirteen, and between the sixth and the eleventh year, only one to twenty-two and a half. (See Table, p. 142.)

I shall close this chapter by recapitulating briefly a few of those practical maxims which have been regarded, in this and the preceding chapters, as among the most important to guide the practitioner of Lithotrity.

1. It is occasionally desirable that the urethra be accustomed to instruments before operating, so that the lithotrite, which it is necessary to employ, can be passed without causing much uneasiness, or any bleeding (p. 154).

2. Always operate, whenever this is possible, without previously disturbing the bladder by injecting or sounding (p. 178).

3. Having determined the position of the patient according to the necessities of the case, slowly introduce the lithotrite, and take care that the blades reach or pass beyond the centre of the bladder before the male blade is withdrawn.

4. Execute every movement deliberately; open and close, incline, or rotate, slowly, without any jerk whatever; and all without bringing the blades into rough contact, as far as it is possible, with the walls of the bladder.

5. Maintain the long axis of the instrument in the median line of the body and the blades at or near the centre of the bladder, this being the area for operating mostly to be chosen. In screwing home the male blade to crush, it is especially necessary to keep the instrument steady, to avoid much vibration of it, or much lateral movement of the blades from its axis at each turn; a small deviation at the handle produces a large one at the blades.

6. The position of a large stone is often very near the neck of the bladder. But the position of the stone varies much in different cases. When it is difficult to find or seize, the reason usually is, that the stone lies close to the neck of the bladder, so that the male blade, when drawn out, impinges upon the stone, instead of including it within the grasp of the instrument. It is necessary then to insinuate carefully, by a lateral movement, the male blade between the stone and the neck of the bladder (p. 194).

7. When the stone is caught, especially if in the fenestrated lithotrite, rotate it a fourth of a turn on its axis

before screwing up firmly or crushing, to make certain that nothing is included besides the stone.

8. Having broken a stone or a large fragment, the operator may pick up and crush piece after piece consecutively, without further searching, if he is only careful to work the lithotrite exactly at the same spot—the patient of course not shifting his position—since fragments fall immediately beneath the blades of the instrument, and rest there (p. 196).

9. Never withdraw a lithotrite *loaded* with calculous débris; a moderate quantity will come away between the plain blades; but if an impediment is felt at the neck of the bladder on withdrawing, return to the centre of the cavity and unload them. This can always be done with a properly-constructed lithotrite (p. 200).

10. No sitting should exceed five minutes in duration, except under very peculiar circumstances. The large majority of sittings should occupy only two or three minutes, some less. The mere sojourn of a lithotrite, without any movement, for three minutes in the bladder, causes uneasiness, and often subsequent irritability, which may be considerable if the time is prolonged.

11. If the patient experiences an unusual amount of pain at the commencement of any sitting, it is wise to postpone it until another day, or make the sitting very short. Such unlooked-for pain is a useful intimation that the urinary passages are not at this time in fit condition for our purpose, and by acting upon it, we may avoid serious mischief (p. 227).

12. After a sitting it is generally desirable that the patient should have a hot fomentation to the pubic region, remain in the horizontal position, and pass his water in

that position if he can. He should remain tolerably quiet until the débris has passed, which usually happens within three days of the sitting.

13. The removal of débris by injecting and washing out the bladder is to be considered the exception to, and not the rule of, practice.

CHAPTER XII.

THE EMPLOYMENT OF LITHOTRITY IN CASES WHERE, BESIDES CALCULUS, SERIOUS ORGANIC DISEASE OR OTHER COMPLICATION EXISTS.

Lithotrity in—1. Organic Stricture of the Urethra—2. Hypertrophy of Prostate —3. Atony and Paralysis of the Bladder—4. Sacculation of the Bladder—5. Tumours of the Bladder—6. Renal Disease—7. Multiple Calculi.

THUS far it has been assumed, in describing the proceedings of Lithotrity in detail, that the cases to which it is applied are those of patients in the enjoyment of ordinary health, or, at all events, that no other serious disease is present.

It is now necessary to inquire what modifications of the operation may be necessary for those instances, where organic disease of some kind is superadded to the calculous malady, and complicates the case.

These may be enumerated for our purpose as follows. Organic stricture of the urethra. The prostate gland much enlarged by hypertrophy. Confirmed atony, and paralysis of the bladder. Sacculated bladder. Tumours of the bladder. Renal disease.

1. Organic stricture of the urethra.—This condition has always been regarded as an insuperable obstacle to Lithotrity. I have not found it so, however, in three notable examples of it, which will be found in the Appendix, as cases 91, 110, and 194.

The manner which I have adopted for overcoming the difficulty is by employing the plan of "continuous dilatation," during three, four, or five days before the ensuing sitting. A gum catheter, of small size, is introduced and tied in the bladder, a proceeding which merely confines the patient to the house, not necessarily to bed. In two days this may be replaced by a larger size, say No. 6 or 7, and in two or three more, by No. 10 or 11. It is then desirable to give chloroform and to use a rather small flat-bladed lithotrite, introducing it three or four times, and removing with great care the débris made. The same plan may be recommended after a few days, and a shorter period of tying-in will probably then suffice. While writing this, I am just concluding the treatment of a fourth patient, now lying in one of my wards at University College Hospital, on this system. He was cut for stone eight years ago, and had a phosphatic formation of rather large size in his bladder. There is a stricture at five inches from the meatus, admitting, at most, No. 6 on admission.

I am not certain that all cases of stricture will be amenable to Lithotrity henceforth, but there is no doubt that for most it may be made successful, and I think always whenever the stone is small. For large hard stones Lithotomy will still probably be preferable.

2. Hypertrophy of the prostate.—The coincidence of a moderate development of this condition with calculus in the bladder I have found to be so frequent in elderly patients, and so inconsiderable in its bearing on the operation, that I do not regard it as worth taking into consideration in relation to treatment. But when the gland is very large, and when it is eccentric in form, as through the presence of polypoid out-growths or of rounded masses into the cavity of the bladder, a serious complication is

sometimes presented to the surgeon. I am bound to say, however, after operating on a considerable number of such cases, that less difficulty is presented than might be anticipated. Careful manipulation to avoid bleeding, one of the principal sources of evil, is essential, and therefore gentle and restrained movements of the lithotrite must be adopted. At the same time, much of the work must be done with blades reversed, and even dipped deeply behind the prostatic growth; and this is by no means difficult, the depression there admitting access of the instrument as readily or more so than in the healthy bladder. But the fragments are not expelled by the natural efforts, and must be removed by the lithotrite and by Clover's apparatus. The use of the ordinary catheter is often necessary for these patients as a habit, and by its means some of the finer débris passes, and a little washing out daily with the four-ounce gum bottle, not with a powerful syringe, assists the process. It is by no means unimportant to maintain a gently relaxed condition of the bowels, which favours alike the expulsion of urine and of débris in these subjects, while constipation always adds to their discomfort. If straining or tenesmus occur, morphia suppositories can be employed; the usual material of cocoanut butter, containing from half a grain to a grain, furnishing as good a form as can be employed. The frequent use of a very hot bidet is superior to hot hip-baths, as being less weakening, less troublesome to the feeble and aged patient, and really more efficient.

Sometimes, during an attack of great frequency in micturition, a vulcanized catheter may be retained for a few days with singular advantage; or the ordinary gum catheter, according to circumstances. Of the general treatment of such patients I say nothing here, beyond adverting to the need which always exists for the surgeon to be guided mainly in each case by the knowledge of previous habits and constitutional tendencies, which at sixty, seventy, or eighty years of age, are not to be ignored, or much interfered with: and that also, especially for these, a study of diet and habitudes is as necessary as the study of medicine, strictly so called.

3. Confirmed atony and paralysis of the bladder.—With either of these two different conditions, it is by no means uncommon to find stone in the bladder. Patients, who are younger than those who are the subjects of retained urine from hypertrophied prostate, already referred to, find it necessary, from the causes above named, to pass all their urine by catheter, and when they form stone, it is mostly phosphatic in character. Here the complication is far less formidable than that which has just been described. The organs are habituated to the contact of instruments; no deformity exists; there is only a flaccid bladder and a want of tone in its coats. All that is necessary, beyond the crushing of the stone, is its removal by instruments, the lithotrite and the evacuating apparatus of Clover.

4. Sacculation of the bladder.—This is one of the most serious and unpromising conditions which can complicate any proceedings to remove a stone. It is unquestionably unfavourable in Lithotomy, and in Lithotrity it is the source of failure and of danger. Unhappily, the diagnosis of sacculation is not by any means always possible. I have diagnosed a sac during life, and verified the statement by autopsy; but in the majority of cases in which sacs exist, I know no means of accurately determining the fact during life. For example, after some years of obstruction to the outflow of urine, partially relieved by the catheter or not,

an elderly patient may exhibit the following phenomena:—He habitually uses the catheter, say two or three times daily, and after the contents of the bladder have been apparently withdrawn, some dribbling of turbid urine through the instrument continues. This occurring only to a slight extent, denotes merely inequalities in the cavity, produced most commonly by irregular masses of prostatic outgrowth. But if it continues to a considerable extent, and, "à fortiori," if, having made the patient lie on each side alternately for two or three minutes, he rises to the standing position, and then some ounces more are withdrawn, there can be no doubt as to the existence of some sac or sacculi in the bladder. This experiment I have tried repeatedly, and upon it have founded a diagnosis of sacculation which has been ultimately confirmed by examination after death. In one of the cases in which these circumstances occurred, I found two small calculi which never could have been detected (while within the sac) during life.

In cases of death in aged patients, occurring after Lithotomy and Lithotrity, and especially when it follows slowly and insidiously the commencement of habitual use of the catheter, for elderly men who had been the subjects of long neglected chronic retention of urine from enlarged prostate, it is by no means uncommon to find sacs in the bladder. Often these are small and numerous, less frequently they are large, but in any case they seem to conduce in some manner to the unfavourable issue. They become the depositories of decomposed urine, which rarely altogether issues from them; thus chronic but severe inflammation is set up, and not only cystitis, but even peritonitis may be produced, for many lie in close contact with that membrane.

In Lithotrity, fragments may be caught in these recesses, and augment the irritation, while their removal becomes impossible. When, in the course of the operation, the surgeon has reason to believe that sacculation exists, he will remove débris as freely and completely as he can at each sitting, leaving only large fragments to be attacked at the next, so as to diminish as much as possible the chance of small pieces becoming entangled and fixed in the vesical walls.

Should, however, the diagnosis be clear before commencing any proceeding, it is probable, other conditions being equal, that Lithotomy might be somewhat less hazardous for such a case than Lithotrity.

5. Tumours of the bladder.—These, prostatic growths being of course not included in this category, are so rare, that the question of applying Lithotrity for a patient with a tumour in the bladder can very seldom arise. I have operated in one instance only, and in this the growth was encephaloid. The only indication there presented, was to operate with extreme gentleness and care, so as to avoid occasioning hæmorrhage. The space was limited, but this, if the stone is not large, is scarcely a serious objection. The patient lived some months after the removal of the calculus, and his sufferings were much mitigated in consequence.

6. Renal disease.—I have had to perform Lithotrity several times for patients suffering with manifest and advanced disease of the kidneys. Such individuals exhibit tendency to severe constitutional disturbance, such as fever, irregularities in the excretion of urine, &c., much more readily than those who are not so affected. It is often with no little anxiety that the symptoms must be watched

in these cases. The main object of the surgeon in performing the necessary manipulations, is to produce as little irritation as possible. He will make the sittings short, not do much on each occasion, and give long intervals if necessary between each. If fever supervenes, a long interval to recruit will be afforded, if local symptoms permit. Then, as a rule, the patient should be entirely confined to his bed, and on the least sign of fever or of pain in his loins, hot cataplasms of linseed, sprinkled with mustard, should be applied to the back. All rapid changes of temperature should be provided against, the sufficient action of the bowels ensured, and the powers of life supported by unirritating nutritious diet.

7. Multiple calculi.—It is by no means uncommon among elderly patients to find several small calculi in the same bladder. Weight for weight, the advantage is on the side of the numerous calculi, as compared with the single one. No large fragments are made in granulating small stones: no sharp, rough, and irritating masses follow the crushing process. When two or three calculi of considerable size are found in the bladder, in the place of one, the amount of manipulation which will be involved by the numerous sittings necessary, to remove a large quantity of calculous matter, augments the risk. Still the case is more amenable to the lithotrite, than if the total amount of calculous matter existed in a single compact mass. In dealing with a case in which the presence of two or three stones, say each the size of a filbert, has been demonstrated, one only should be attacked at first. The unbroken stone, with its surface more or less smooth, is a less irritating object than the angular pieces which are produced by a single crush of the instrument. The operator should,

therefore, at each sitting continue to apply the crushing process to the small pieces which he meets with, and reject the second entire stone whenever it falls into the jaws of the instrument, until he has nearly disposed of the first. This is the rule, always to be pursued as far as possible with multiple stones, and it will enable the operator to avoid the danger which, from crushing indiscriminately and freely everything that comes within his power, is apt to arise, in injury to the bladder, from the irritation produced by a quantity of large and sharp fragments.

CHAPTER XIII.

THE RESULTS OF LITHOTRITY.

Difficulty of estimating the Results of Lithotrity.—Brodie's Experience.—Reports by Civiale.—The Author's Experience.—Its Results analyzed:—1. The Recovery Rate.—2. General Conditions of Patients afterwards.—3. The Return of the Malady.

DURING the thirty or forty years which have elapsed since Lithotrity first claimed to be recognized as a surgical operation, more or less applicable to a large number of cases of extreme importance, occasional attempts have been made to determine with precision the results derived from its employment. At first sight this object might be thought easily attainable, since it would seem necessary only to compare a sufficiently large number of cases, so treated, with a similar number of cases by the single pre-existing operation, that of Lithotomy. The capabilities of that method were well known, or might be obtained without difficulty. The cutting operation had been applied under all circumstances, and to all cases, to young and old, to stones of all sizes, small and large, and the effect of it, in any case, could never be doubtful.

With Lithotrity, however, it was soon found to be a much less easy matter to arrive at an accurate appreciation of the result. After a few years of trial, it was quite obvious that the crushing method was even more hazardous than cutting for large stones: and for a few stones of particularly hard structure it was impracticable. For a great majority of the cases of infants and children, it was certainly less successful than Lithotomy. It was applicable, then, only to a certain proportion of adult cases; and did not include among them the most formidable. On this ground alone, the comparison between its capabilities and those of the old method could not be easy. One thing was clear, namely, that as it was only applicable to what might be called, to some extent, selected cases, its results for these ought to be very successful, or Lithotomy ought not to be set aside for it. At the same time, it was not to be forgotten, that although Lithotrity necessarily demands as a condition of successful performance, a stone of not too large a size, it does not necessarily demand youth or strength of constitution, that it makes no insuperable difficulty of any age, nor a serious objection to whatever feebleness of body great age involves, provided only that the first condition exists, viz., that the stone be small.

An absolute comparison of results, therefore, is difficult. Lithotrity cannot be judged in this matter, unless the ages of the patients and the size of the stones dealt with are accurately known. For it is obvious that if the Lithotrity of one surgeon embraces only stones of three drachms in weight, while that of another surgeon deals with all that occur up to five or six drachms or more, the operation of the latter will in the aggregate be a more hazardous proceeding, and will be attended with more numerous and graver casualties than the operation of the former. After much consideration of the question, I confess it appeared to me that, owing to these and other circumstances, an accurate and careful appreciation of the results of Lithotrity has not hitherto been made. That, perhaps, which most approaches to it is the valuable paper contributed by the late Sir B. Brodie to the "Transactions of the Medical and Chirurgical Society," fifteen years ago; one which excited great interest at the time.

The distinguished author made no endeavour to establish a case either for or against Lithotrity. He recorded all the casualties, and made no attempt to lessen their importance, or in any manner to explain away their relation to the operation. And in regarding this record of Sir B. Brodie's experience as, perhaps, one of the best existing contributions to a real knowledge of the value of Lithotrity, I do not overlook the fact that, during the last few years, the late M. Civiale has published annual reports of his practice, giving the number of patients, and in part the results of his operations. These reports, however, never at any time contained the particulars which are essential in order to enable others to form a judgment, and which I have felt it a duty to furnish in the table of cases now given at the end of this work. It was impossible to know that clever operator without feeling that his natural bias for an operation he had mainly designed, was the first to perform, and with which he was so intimately identified during life, and even after death, led him, as is universally confessed, to estimate his results more favourably than an unbiassed looker-on could venture to do. In short, he barely admitted that Lithotrity could occasion death. It is useless to deny this fact, nor that it influences all his writings on this subject. He invariably attributed death, when it occurred in the course or after a case of Lithotrity, to some other cause, never to the operation. Such was, without doubt, his conscientious belief: and practically for him, although he never actually and formally affirmed it, Lithotrity was never fatal.* But the mode of reasoning he employed would render almost every operation in surgery innocent of fatal results. To Civiale I desire, on every ground, public and private, to render due homage. It is no small boon that his skill and indomitable perseverance have conferred on suffering humanity. But the mode of estimating the results of an operation which he adopted in relation to Lithotrity, is not one which is, or can be, accepted here. As long as it is an accepted formulary that death may be produced by a surgical operation, and that the liability to cause death is a quality which can be approximately estimated by observation, and the knowledge of which enables us to speak of an operation as more or less grave, according to the amount of such liability proved to exist, we cannot make an exception of Lithotrity. Lithotrity does not less surely destroy life in certain cases, although no palpable lesion may be produced, than Lithotomy does, when the necessary wound proves fatal. The catastrophe is only much more obvious in the one case than in the other.

With this conviction, I have therefore made it my object to test, as carefully and impartially as it is in my power, the operation of crushing the stone as applied to all cases up to a certain weight, with regard to its after-results, both immediate and remote. The main objects of inquiry being the number per cent. of recoveries after the operation, the proportion of cases in which the stone recurs, and the condition of the recovered patient in after-life, the last being, from the nature of things, the least easy of inquiry.

With this view, I resolved to present to a meeting of the British Medical Association in Dublin, in 1867, an analysis of 100 cases of operation for stone in the bladder, 84 of which were by Lithotrity. Since that time I have operated, not reckoning Lithotomy, on 120 cases by Lithotrity alone, making a total of 204 cases, occurring consecutively in my practice—not one having been omitted. All have been performed within about the last six years, at the commencement of which term I began to employ my present instruments, and had developed my present method, and by these all have been treated. They are therefore well adapted to be regarded in one group, with reference to the question of results, and my object here is to offer a resumé of the facts presented by these cases, as well as of those inferences which this large number of clinical histories, carefully watched and recorded, enables me to draw.

---

* "La Lithotritie et la Taille." Par Civiale. Paris, 1870. Chap. X. "La Lithotritie, peut-elle occasioner la mort ?"

Of every case I possess full written notes, made at the time, as well as the stone itself (with very few exceptions indeed), carefully preserved and labelled for reference. I adhere to the system of verifying each one by naming some gentleman who has seen it with me,—a system unnecessary, I am quite ready to believe, for my contemporaries, but which will form a guarantee of accuracy to unknown or future observers and commentators. The cases themselves will be found in the Appendix at the end of the volume, each briefly reported; further details being afforded of all those which terminated fatally.

In offering an analysis of these 204 consecutive cases of Lithotrity, I must first state that they all occurred in adults, and for the most part of an advanced age.

It is still necessary to call attention to this fact in comparing statistics relative to the operations of Lithotomy and Lithotrity, and to remind the reader that all numerical tables are worthless which do not separate the cases of children from those of adults, so different are the results of operations, especially by the knife, which occur above and below puberty respectively. Next, I must state that almost all these cases are those of distinct individuals—only eighteen cases are recorded twice. The relapses—a subject which we shall consider hereafter—were few, and when a third operation has been necessary in one individual's lifetime, which has occasionally, though rarely, happened, I have not recorded it, making a rule that no patient should appear more than twice in the list.* Otherwise "cases" might be unduly multiplied, were operators disposed to register every occasion on which some calculous matter is removed from a patient, occasionally met with, who is continually or frequently forming it.

Thus, in the paper by Sir B. Brodie, already referred to, 115 cases were recorded. But Sir B. Brodie frankly states that eight of them occurred in the person of one individual in the course of as many years, and that other cases of a similar kind were included (vol. xxxviii. p. 185). So that the 115 cases might by no means represent even or more than a hundred individuals. In this list the 204 cases occurred in 185 individuals. Lastly, it must be remembered that the expectation of life, and the general quality, as regards health, of these patients is a little below the average; since it includes so many of those old and confirmed cases which seek the aid of a well-known operator, as a forlorn hope, and are attracted for this purpose from every part of the world. Most of these patients are from different parts of Great Britain, but the table includes also patients from France, Germany, Turkey, Russia, Canada, Belgium, the United States, California, the East Indies, and New Zealand.

---

* There is one exception to this rule. The following are a few particulars:—The circumstances of this case were so unusual that it was necessary to make an exception—*the only one*—to the rule laid down. A gentleman, aged seventy years, in May, 1865, was the subject of a large uric-acid stone, rather beyond the ordinary size for Lithotrity. I crushed it successfully in nine sittings. He pursued his avocation in perfect health for two-and-a-half years, and then, after a few months' symptoms, came to me again in April, 1868, with a uric-acid stone about the size of a nut. This was crushed in three sittings, after which, for a year at least, he enjoyed perfect health, freedom from calculous symptoms, and led an active life. Gradually he commenced to feel more frequency and pain in micturition, but an enlarged prostate requiring the use of the catheter (by himself) once daily, has, no doubt, as it often does, prevented the severity of former experiences. He applied to me, therefore, a third time, August, 1870, when I found, no longer a large stone, but numerous small ones, probably from fifty to eighty, which I removed in six sittings, under chloroform, as the débris required to be artificially removed—the result weighing upwards of an ounce! He is now again quite well and active, being nearly seventy-six years of age. This case appears in the series as No. 40, No. 123, and No. 202.

In commencing this analysis it is necessary to bear in mind certain important facts relative to age. They may be briefly stated as follows:—The mean age of the 204 cases is rather more than 61 years.

The youngest patient was 22 years old; only 3 were below 30 years; the eldest was 84 years. There were 53 cases of 70 years of age and upwards; no less than 126 of the 204 were 60 years and upwards. Next, with regard to that important point, the size and weight of the stone, I may say that I have, as a rule, to which but few exceptions have occurred, applied Lithotrity to every case of stone under my care which has been obviously beneath an ounce in weight. At one ounce and upwards I have preferred Lithotomy. I may add, for the sake of giving a criterion as to size, that a uric-acid stone which weighs an ounce equals in size a large date. I know no better comparison.

In examining the results of the operation in these cases, I shall inquire, first—What is the rate per cent. of recovery, after the operation? Secondly, What is the general condition of the patient after it? And, thirdly, In how many instances is there a return of the malady?

In considering the first subject, viz., the number of recoveries per cent. which took place, I must request attention to the following statements, which are extremely important in relation to the question:—

1. That I have never in my life found it necessary or desirable to complete by the knife a case of stone in which I have commenced the operation by crushing. This has not unfrequently been done, especially in Paris, when the patient's life has been in danger, and in such circumstances, if death has occurred, it has not been placed to the account of Lithotrity.*

---

* I once removed a considerable phosphatic crust from an oxalate-of-lime stone, and so diminished its size previously to performing Lithotomy; that is the only case which might have the resemblance of an exception to the rule, although it is not so in reality. The following case is recorded as being the only other which might, by some, be regarded as in any way exceptional to the above statement. These two individuals are the only cases in which I have performed the two operations on the same person in any circumstances.

I crushed at six sittings for a gentleman several small uric-acid calculi during October, 1863, and the first week of November. In the middle of November he left for the country to recruit his strength, and there, after exposure to cold and wet in exercise, in inclement weather, he had severe cystitis, followed by orchitis, and by a series of abscesses in the scrotum and the abdominal walls, lasting more or less until April, 1870. He then had retention of urine from deep perineal abscess, and a catheter was tied in for some days. His distress was then so severe that it was decided to have an examination under chloroform, and if anything were discovered, to perform Lithotomy. I performed the operation on the 21st, Sir William Fergusson holding the staff, Mr. Pollock, Mr. Marshall, Mr. Hutchinson, and others being present. At the first incision a half-pint of matter issued; quickly dividing a large prostate, I removed two small uric-acid calculi, not coated with phosphatic matter, and quite probably of recent formation: they were not fragments, but small entire calculi, and may have been present, or not, during the period of Lithotrity: on this point there is no evidence. The long period of five months had intervened between the

2ndly. That I have not left incomplete or unfinished a single case of stone on which the operation of crushing has once been commenced: a plan which has been pursued also in Paris, when great difficulty or danger has arisen. The result of sending a patient into the country in these circumstances can very rarely be otherwise than hazardous, or fatal. But when death has so taken place abroad, it appears likewise not to have been placed to the account of Lithotrity. It appears to us unusual, but it certainly is not so in Paris, to send away uncompleted cases, and indeed to refuse any operative aid to a certain proportion of calculous patients who apply for relief. This is a proceeding almost unknown to English surgeons, and one of which some notice is necessary in dealing with the results of the operations under consideration.

3rdly. I have never refused to operate on any case of stone by one means or the other; and I have sometimes consented, rather than refuse the patient all chance of life, to perform Lithotrity, when he has absolutely refused my advice, that Lithotomy would be for him the better operation. I am certain that two or three of the fatal cases in my table occurred in individuals for whom, had I not been fettered by circumstances, Lithotomy would have been the preferable proceeding. Certainly, as a rule, the surgeon must decline to perform any operation but that which appears to him the better of two courses open, but in rare exceptions he cannot refuse to be influenced by circumstances, and adopt the less promising, when by its means some hope of saving life exists.

Lithotrity and the Lithotomy, so that I cannot regard this as necessarily a failure in Lithotrity finished by Lithotomy. The patient is at this moment, December, 1870, enjoying excellent health.

I may now say that the deaths which occurred from all causes, during or after the conclusion of treatment, among the 204 cases of patients averaging 61 years of age, were 13 in number, although one of them, case No. 58, ought, I think, not to be so reckoned; but I wish to err on the wrong side, and am content to accept 13. This constitutes a rate of recovery of 93½ per cent. My first 84 cases included 4 deaths, or a rate of 95 per cent. of recovery. The last hundred were a little less promising, on the grounds named above, and I consider the result therefore to be even better than the preceding. For two or three bad cases only tell heavily against a small percentage rate of mortality in the total.

The seat and nature of the malady which immediately induces a fatal issue may next be considered. That which appears to have been the most common in these cases is inflammation affecting the kidney of one or both sides. A certain amount of cystitis is common enough, in some degree, but usually slight and evanescent in character: it is usually met with at some time or another in most cases of Lithotrity, where several sittings are necessary. In some individuals, however, invasion of the kidney follows it, and is announced by a severe rigor, succeeded by other rigors at intervals of a few hours. Several severe rigors occurring consecutively, as, say, one or two daily during three or four days, should arouse anxiety on this head. It is rare indeed, with these signs, that some affection of the kidney is absent. Fever continues, and slowly increasing exhaustion, and if recovery does not take place, the patient sinks in from seven to twenty-one days; suppression of urine occasionally, but not generally, taking place. The autopsy reveals marked traces of inflammatory action in one or both kidneys and ureters, and, mostly, deposits of pus are formed in the renal structure, and in the course of the ureter. Cases No. 109, 126, 127, 133, 147, 158, more or less illustrate this condition. I am satisfied also that in some or all of these, chronic pyelitis, if not chronic nephritis, also, has pre-existed, occasioned by the calculous affection before any operative interference took place. It must be admitted that, at present, we have not an unfailing means of ascertaining the existence of these conditions. There may be no albumen in the urine and not necessarily are there any deposits in the urine, significant of the renal affection. The urine of a calculous patient frequently contains mucus, pus, and blood; but whether the origin of these is in the bladder (naturally its most common source from the irritation of the calculus) or in the organs above, it is impossible always to determine, and usually there are no casts or other pathognomonic signs of disorganizing renal structure.

In fact, neither physical signs, nor subjective symptoms, are by any means frequently present, yet advanced pyelitis, and even sometimes chronic nephritis, may exist. Another cause of death is acute cystitis, apart from any serious renal affection. In such cases the bladder may or may not be sacculated to some extent—most frequently the latter state exists. When these pouches, not by any means necessarily large, have been formed in the bladder, any instrumental interference, which is continued or repeated (such as daily catheterism for the purpose of relieving an atonied bladder), is liable not unfrequently to induce slowly cystitis or pyelitis, which ultimately proves fatal. Cases No. 61, 69, and 80, are examples of death by this way. No. 49 might also be regarded as another instance. The patient was suffering severely from the affection described, and was much exhausted, but he died suddenly while sitting up in bed to a meal, from failure in the heart's action.

Lastly. Cases 87, 161, and 193, were instances of that affection, unhappily liable to follow all surgical procedures, viz., pyæmia. I imagine there are few operations, however slight, which are followed by so small a number as three in 204 cases. Certainly, in any serious operation by the knife, the risk of pyæmia is very much greater than this proportion would indicate.

In the paper of Sir Benjamin Brodie, before alluded to, in considering the causes of death, he placed them under the two following heads ; and I quote his words as most suitable to the purpose here :—

"First. Cases in which there was a fatal result, arising solely from the operation itself.

"Secondly. Cases in which a similar result was to be attributed to the co-existence of some other disease, brought into an active state by the shock of the operation, but which disease would in itself have been sooner or later the cause of death, even if the operation had not been performed."*

Now, although it is not possible to draw a hard and fast line by the indications here given, still they furnish a useful and fair classification, by which it will not be difficult to arrange the cases of death before us. I take it for granted, that the existence of advanced organic disease of the bladder and of the kidney must be held to place any case exhibiting it in the second category, or that in which death must have occurred sooner or later, even if the operation had not been performed. Having made numerous anatomical examinations after deaths occurring through disease of the urinary organs, after surgical operations upon them of various kinds, I may say that the organic changes alluded to are distinctly definable, and they are as follow :—

---

* Medico-Chirurgical Transactions, vol. xxxviii. p. 186.

1. Marked sacculation of the bladder.

2. Chronic pyelitis with distended ureter.

3. Marked organic changes of a chronic character in the kidney structure.

Could the existence of these conditions be accurately diagnosed beforehand, it might become a question whether the crushing operation, or any operation at all, should be performed. For there is little doubt that the existence of such organic changes is almost as surely a source of fatal issue in Lithotomy as in Lithotrity. Now, in the thirteen cases before us, one or other of these conditions certainly existed in five of the thirteen cases; and had it been possible to be aware of them, the operation would not have been performed, and the patient might have lived a little longer; with much suffering, it is true, and he ultimately must have died at no distant period.

Eliminating these, we have but eight cases in 204, in which the death might be attributed to the surgical operation.

The causes in these eight cases were in some, mere exhaustion; in others, acute cystitis and fever, both occurring in constitutions of a feeble kind; and pyæmia. And this gives a recovery rate of 96 per cent., or, in other words, a mortality in the 204 adult cases of not quite 4 per cent.; and this is undoubtedly the fair view to take of the subject.

The general and local condition of patients after Lithotrity is a subject which has not been studied, perhaps, so much as it deserves. Very little space can be accorded to it here, but there are nevertheless matters of much interest attaching to the after-history of an individual who has formed a stone, and has submitted to an operation issuing in its successful removal. By far the larger number of patients recorded in my list are living still, and are quite free from any sign of the old complaint, and enjoying very fair health, age considered. Thus, three were masters of hounds, and over seventy years of age when operated on. Each one has returned to his duties, and two have enjoyed many a hard day's riding since; the third, though not hunting, still attends the meet, and is comfortable in the saddle. If he lives, as there is no reason to doubt, he will hunt next year. Examples of an analogous kind could be adduced of a very large proportion of the series, and I hope some day to obtain the later history of all the patients treated in private. The hospital patients it is difficult to follow, although some of them are under observation. On frequently seeing instances of the excellent health and condition of a large proportion of these elderly men on whom I have some years ago performed Lithotrity, I am forcibly reminded of the well-known axiom which Deschamps chose as the motto of his classical work on stone ["causâ sublatâ effectus tollitur"]; happily true of so many. With a few it is otherwise, and more so in middle life, I think, even than in advanced age. In these exceptional instances a little chronic inflammation still affects the bladder, or it may be the organs above, and impaired health and local troubles of some kind still persist. The operation can but remove the stone, and those troubles which were due solely to its existence. Symptoms due to other causes, associated or not, as the case may be, with calculous formation, will not disappear with the removal of the foreign body. It would be interesting to know to what extent a kidney, in which a calculus has once been formed, is damaged in the process. Necessarily, not much perhaps, or at all; but sometimes, no doubt, it is irretrievably deteriorated, and is a cause of future ill-health. Then the irritation produced by the operation itself may in some cases tell for something in the production of after-troubles. But I am bound to say it ought to be exceedingly small. It was formerly not small, with the clumsy apparatus, the enormous lithotrites, evacuating catheters, and repeated washings, once thought essential in Lithotrity, and now for the most part swept away from practice. Again, it is not small, if large and angular fragments are dragged through that delicate organism, the neck of the bladder, and along the whole track of the urethra—a practice which more than any other I know has proved damaging in after-life to patients, and consequently to the credit of the operation, of which in reality it forms no part. In order to ensure, first, recovery, and subsequently a complete and lasting cure, it is impossible to avoid too sedulously all unnecessary mechanical interference, nor is it possible to conduct all the manipulations with too much care and gentleness. All this holds good equally, within certain limits, in relation to the question of the future reappearance or recurrence, as it has been termed, of another calculus in the bladder, and this subject naturally follows here.

Thirdly. Recurrence of calculus.

Among the 204 cases, there are eighteen in which the calculus has reappeared, and in which the operation has been again performed. Let it be repeated here, that the mere removal of a few phosphatic débris, subsequently occurring, has not been reckoned as an operation, but only the reformation of a fresh calculus after a year or more of absence on the part of the patient.

Now, there are two ways by which calculous matter reappears after an operation of Lithotrity. First, there may be a fresh descent from the kidney into the bladder; either a uric-acid or an oxalate-of-lime formation, and occasionally, but rarely, a phosphatic calculus, may be produced in the pelvis of the kidney, and having found its way into the bladder, may form the nucleus of a larger stone, if it is not expelled naturally, or removed by artificial means. This occurrence may follow equally either the cutting or the crushing operation, and does take place in a certain proportion of all cases. It was noted in seven of the 204 cases, and at the respective ages of 71, 49, 63, 73, 74, 50, and 64, and the intervals between the first and second stone was, in each case, respectively, two years, three years, four years, one year, one year, three years, and six years, in the order given. Secondly, another, and a wholly different mode of calculous formation has to be described. And this is probably somewhat more common than the other. To a certain extent, but not altogether, it is to be accepted as an opprobrium to Lithotrity. Happily, the frequency of its recurrence is to be diminished by perfecting the crushing operation in all its details. At the same time, it is by no means unknown after Lithotomy, although it is rare after that operation. It occurred in eleven cases of the 204. I think it may have occurred in three other individuals, whom I have lost sight of or have since died, but I cannot affirm this; it will be fair, I believe, to add three, making fourteen altogether of recurrence through persisting chronic cystitis. For this is the real cause in most of these cases. If severe, prolonged chronic inflammation of the bladder is produced or perpetuated by mechanical disturbance, due in part to the pre-existence of the stone itself in the organ, in part to the employment of instruments, and in part to the presence of sharp irritating fragments necessarily produced in the operation, it sometimes happens that a large quantity of triple phosphate is rapidly formed within the bladder, and becomes a more or less persisting deposit. If neglected, fresh calculus is very likely to result. No doubt, in most cases, by much care, by emptying the bladder daily, injecting it, &c., this reproduction may be prevented. In some constitutions, the tendency to produce phosphatic deposit thus, is much more marked than in others, and the formation in question by no means corresponds precisely with the degree of inflammation which has been present. A small degree will give rise to it, in some individuals; a very large degree will fail to do so in others. Still it is quite clear that the more perfect is the operation of Lithotrity, that is, the smaller the amount of irritation produced by the mechanical means employed, the smaller is the risk of its occurrence. Hence it is unquestionably a sequence of Lithotrity, the chance of which is diminishing, and has diminished, in proportion to improvements in the manner of performing the operation. It is an additional reason, if one were wanting, for avoiding by every means possible, all sources of injury or irritation to the bladder and urethra, such as the forcible removal of large fragments, over-exercise by the patient in the intervals of the sittings, over-instrumentation generally, &c.

In some cases, the tendency to form these phosphatic deposits is subdued by treatment, or wears itself out in time. Among the eleven patients so troubled, in four cases it persists, in the remaining seven it has disappeared altogether. In all cases, the morbid product can be always easily removed, and the patient relieved, at all events for a time. One cause of persisting phosphatic formation, although a rare one, is beyond doubt encysted calculus. This I have been able to verify. A sac of the bladder, perhaps usually a small one, contains a calculus, the narrow neck of the sac not permitting the possibility of escape to the foreign body. A small surface of the calculus is thus exposed in the bladder; on this surface, phosphatic salts are encrusted, and as the deposit goes on, a more or less spheroidal body is produced, the attachment of which to the encysted calculus is by a narrow and brittle neck. Ultimately this snaps, and a phosphatic calculus is set free in the bladder. This is removed, the symptoms disappear or are much relieved, and the process again commences as before, and is reproduced again and again. I may repeat, that I have several times observed this condition—in the dead body not infrequently, in the living three or four times: one of these latter cases was identified by examination with my friend, Mr. Cadge, of Norwich, when in consultation on a long and troublesome case of this kind. I have exhibited and recorded several post-mortem examples of this condition at the Pathological Society, and elsewhere.

I now come to the important practical conclusion which, I beg to submit, is logically derivable from the data before us. It is not offered here as my opinion, or as the opinion of any other person experienced on this subject. It is a conclusion which the facts recorded inevitably indicate. I have long ago had to contend that Lithotrity, properly performed, is an eminently successful operation; the proof that it is so is now patent to all. For a certain and by no means limited number of cases, its success may be regarded as a certainty; absolutely without fear of any contingency, except such as attends the minor operations of surgery; for example, the opening of a small abscess or the passing of a catheter. *For I have never lost a single patient in the whole course of my experience after crushing a stone which was no larger than a small nut.* And this is a size at which, with very, very few exceptions indeed, every stone ought to be discovered. But this very fact leads me to remark, that the success of Lithotrity cannot therefore be considered, apart from a knowledge of the extent, in regard of the magnitude of the stone and the constitution of the patient, to which the capabilities of the operation have been pushed. When it is employed for stones as large as a date or a small chestnut—and it is impossible to deny the excellent chance of success which this method offers to the subjects of such stones—a certain, but still only small, proportion of deaths must be expected. And the rate of mortality will correspond with augmentation in the size of the stone, and with the amount of existing disease, and age, on the part of the patient. Given a small stone, in a fairly healthy person, and success is certain; the possibility of contingency in such a case depending only on the presence of those remote and excessively rare conditions which will make, for an individual here and there, the mere passing of a catheter a cause of death.

As to the extent to which I have pushed the capabilities of the operation here, the preservation of the débris, which were exhibited last spring at the Medical and Chirurgical Society, enabled the observer to judge. Many of them were as large as a small chestnut, some were even larger. Further, it has been already stated in the seventh chapter, "On the Results of Lithotomy," that while the proportion of patients submitted to Lithotomy and to Lithotrity respectively has been among some operators about equal, although the proportion crushed now, I believe by most surgeons, is mostly larger than that submitted to the knife, I have ventured to regard Lithotrity as the rule, applying it to five out of every six adult cases, and to employ Lithotomy only as the exception. (See pages 144–6.)

It may be as well to put on record here the composition of the calculi. Of the 204, uric-acid and the urates amounted to 135; 47 were phosphatic; 16 were mixed; 4 were oxalate of lime; one was pure phosphate of lime; and one, a rather large one, was cystic oxide.

CHAPTER XIV.

ON THE CHOICE OF PROCEEDINGS BEST ADAPTED TO DIFFERENT CASES.

Importance of accurate Diagnosis.—Without it Choice of Operation impossible. —Sounding.—Classification of Stones.—Questions to be determined respecting the Stone.—1. The Age of the Patient—Results of Investigation; Ratios of Death at Different Ages in 1,827 Cases of the Lateral Operation, Metropolitan and Provincial; how affected by Age; Prevalence at Different Ages.—2. Absence or Presence of Local Disease, their bearing on the question of Operation.—3. Susceptibility to Constitutional Disturbance.—Final Deductions as to Choice of Operation for Different Patients.—When not to Operate.—Immense Importance of Detecting the Stone at an early Period.

In approaching that final appreciation of the various methods which have been described, we cannot but be struck with the single broad feature which marks our subject at the present day, and distinguishes it from the subject as it has been dealt with in times which are past.

An appreciation of methods was impossible when only one method existed; or at most, but one other for very exceptional cases. Given, the simple fact of stone in the bladder, it was, but a very few years ago, removed, as a matter of course, by incision after the lateral method; only here and there, the high operation was resorted to. Nevertheless, the body to be removed might be so small as to be almost inappreciable; it was sometimes carried out by the first gush of urine when the bladder was opened, and was never discovered. It might be smaller in size than an apple-pip, or as large as a turkey's egg, still one and the same set of incisions was practised; these being lengthened, perhaps, in some cases, if the existence of a very large stone was suspected. But as new methods of operating were designed, and especially when the possibility of removing a calculus by crushing had been demonstrated, a new ground of inquiry became necessary to success, one which had been almost overlooked because barely required before. It followed instantly from the new phase into which practice had entered, that a *diagnosis of the size, form, and chemical characters of the stone was absolutely necessary.* With various modes of Lithotomy to select from, adapted to various conditions of the patient and of the stone itself; with Lithotrity and its varied resources besides, it becomes at once a matter of the highest importance, if any advantage is to accrue from the discovery of the latter, that the case and the method should be judiciously adapted to each other. Otherwise it might happen, and I do not hesitate to say that it did happen, in the earlier experiences of Lithotrity, especially when it was first attempted by others than the originators of the art, that the new method, although a great advance in surgery, at this time actually increased the fatality from stone operations, and was a positive calamity for many stone patients at that era. I have abundant evidence of the increased mortality which was occasioned by it during the period in which its application was mainly experimental. This apparent paradox is easily explained; the cause was, partly, that experience was at first necessarily wanting, by which to form rules for the operator's guidance, and partly, that the importance of diagnosing the characters of the stone had not been perceived. Hence patients who were well adapted for Lithotomy, and who would have been saved by it had Lithotrity not come into vogue, were submitted to the crushing operation, which was unfitted to their cases and terminated them fatally. Hence, also, much undeserved obloquy fell on Lithotrity. These sad illustrations of the want of adaptation of the method to the case were then numerous, and this depending very greatly on the absence of a correct diagnosis as to the nature of the body to be removed from the bladder, and of the varied capabilities and adaptation of each of the principal means for effecting its removal. And I will venture to say with deliberate conviction, that the importance of such a diagnosis is not sufficiently perceived at the present day, and consequently only a portion of the advantages placed within our reach by modern methods have yet been attained. The increased resources of surgery render this a most important branch of inquiry; one, indeed, to which it is absolutely necessary for the practical surgeon to devote himself. Otherwise these resources will become the occasion of misfortune rather than of benefit, and will diminish rather than augment the success of his practice.

It must therefore appear that an appreciation of the absolute and comparative values of the varied operations which are offered for our selection is not possible unless it first be granted that we are able to diagnose the physical and chemical characters of the stone, before any attempt is made to remove it from the bladder. Unless, then, this can be done—unless, indeed, it is done with tolerable accuracy, it will be better to return to the use of a single method, say the lateral operation, than to risk the application by guess of a method inapplicable to the case. Thus to take an extreme, but quite possible, case for illustration, let us suppose two adults, one of whom has a small, friable stone, the other a large compact one; that, being deceived as to the relative proportions of the stone from want of care in diagnosis, I decide to cut the patient with small stone and to crush the large stone; I run a certain risk of losing both, and do so; whereas, had the terms of my decision been reversed, the chances are that both were saved. But had the lateral operation been employed in both, the chances are equally great that I should at all events have saved one.

I repeat, then, that it is probably safer, uniformly to practise Lithotomy in every instance, if the surgeon does not arrive at an accurate diagnosis of the nature of the stone, and select an operation in accordance with it.

There are two principal facts which it is necessary to ascertain respecting any stone which it is proposed to remove from the bladder; its size and its texture. In a degree subordinate to the latter character, it is desirable to know its chemical characters. It is highly important, also, to ascertain the patient's susceptibility in relation to instrumental interference, a matter which has already been alluded to.

In sounding a patient for the purposes of diagnosis, we should place him usually in the first position for Lithotrity, as already described (p. 174); if we do not succeed in that position, or if his prostate is enlarged, he should be placed in the second position (p. 176). Furthermore, it is absolutely necessary that the sound should have a form altogether different from that of a common catheter. Its curved part, or beak, should be little more than an inch long, and have more of a tendency to form an angle with the shaft than exists in the catheter. It can then be easily inclined to right or left, or rotated completely if need be. Various forms are employed for the purpose; that shown at Fig. 87, and represented in the reversed position within

FIG. 87.

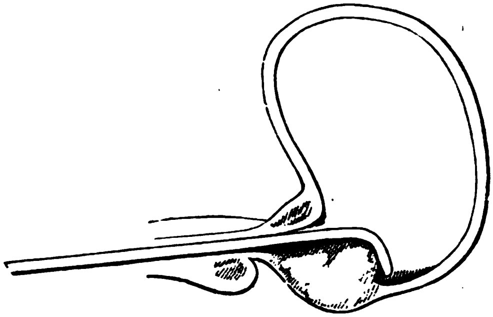


Fig. 87. Sound, with small curve, for exploring the bladder. An opening is seen in the convexity of the curve for increasing or diminishing the fluid in the cavity. The beak is solid.

the bladder, is a very excellent model, and, being less angular than some, passes with greater ease. But then it is hollow also, enabling the operator to inject more water into the bladder, or to withdraw some during the process (a valuable resort in cases of obscurity), without change of instruments for the purpose. Thirdly, we may use a sound which enables us to measure the stone with precision. It may have a blade which opens so as to seize it, and an index in the handle, like that in a lithotrite, which indicates the diameter when seized. But a light lithotrite, with the cylindrical handle (see fig. p. 170), is the best instrument to measure with; the sound with a sliding blade is superseded by it. But it is a material advantage to employ the cylindrical handle also for the ordinary sound, since the instrument may be turned on its axis, right or left, or be reversed, with much greater ease and delicacy than with the flat handle usually made (fig. 88); only it is necessary that a mark should be placed on the handle to indicate the direction of the beak.

FIG. 88.

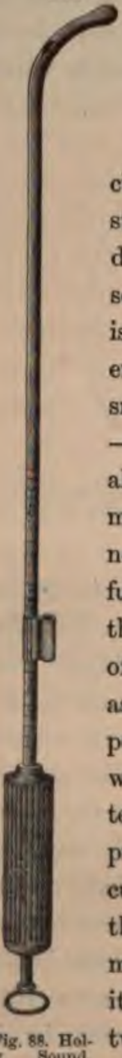


Fig. 88. Hollow Sound, with cylindrical handle; for exploring the bladder.

The act of sounding should be performed precisely in the manner in which the search for the stone or for fragments by the lithotrite is conducted, and which has been already fully described. A large stone, it may be recollected, is generally encountered immediately on entering the bladder, near to its neck. A small one is often—but certainly not always—situated at the back of the trigone, and all generally lie either right or left of the median line. If not at once encountered, it is necessary to explore consecutively and carefully the upper and lower parts, and the sides of the bladder; also with large and small quantities of fluid in it: and finally in the upright, as well as in the horizontal position, although this latter position is very rarely necessary. When, notwithstanding all, the stone still remains undetected, as when it lies behind an enlarged prostate, for example, and in some other circumstances, something may be gained by placing the forefinger in the rectum, where the stone may be felt distinctly, or lifted up so as to place it between the finger and the sound, or between the jaws of the lithotrite.

The stone being found, the characters are next to be determined. These may be classified as follows for facility of reference:—

I. *Size.*—With regard to size, stones may be classified as *Small*,
Medium, and
Large.

II. *Texture.*—With regard to textures, stones may be classified as *Soft*, and
Hard.

And hard stones may be either $\begin{cases}\textit{Friable}, \text{ or} \\ \textit{Compact}.\end{cases}$

Every possible variety in size necessarily exists between the two extremes of small and large, and some latitude in the use of these terms, as well as in that of medium, must be afforded. Hence, they convey only an approximative estimate in any case: a stone, however, measuring an inch in diameter, which may be held to include the mean of two diameters, the longest and the shortest, may be regarded as a type of the medium size.

With regard to texture, the variations are more marked: each chemical constitution indicating distinctly certain physical characters.

Soft Stones are phosphatic, with chiefly earthy bases. The urine is alkaline, and is charged with earthy phosphates. Pus and mucus are also commonly present.

Hard Stones are oxalate of lime, uric acid, urate of soda, and mixed, *i.e.* alternating layers of uric acid, or urate with phosphatic deposit. The urine is mostly acid, contains crystals of uric acid; the amorphous deposit of urate of soda, or the octohedra of oxalate of lime, and if any of these are found as a persistent deposit in any given case, it helps to establish the nature of the calculus.

But while all of these are "hard," some are friable, while others are not so, but exceedingly compact in their structure. This is a distinction of great practical import in Lithotrity. Hard, but friable, stones break without the exercise of great power; and they crumble into small granular masses, instead of fracturing into sharp angular portions as stones of compact structure are prone to do.

Each kind of calculus has its own mode of breaking. Thus oxalate of lime, which is very compact, requires great power to fracture it, and it mostly forms irregular jagged masses.

A uric calculus, when nearly pure, has an exceedingly compact texture; it requires considerable power, and fractures into wedge-like splinters, which are very hard and sharp.

Urate of soda is looser in texture, friable, and granulates easily under smaller degrees of power than are required for either of the preceding calculi. The mixed calculus also breaks easily, because its several layers have unequal powers of resistance; the phosphatic constituent granulates, and the thin alternating layers of uric acid, or the urates, fracture into flat and shell-like pieces. These general indications are practically sufficient without descending to minor distinctions or rare varieties of calculus.

Cystine—but this is of very rare occurrence—is hard, and rather friable: it breaks up into small granular masses and passes easily. I crushed one large one four years ago in the person of a gentleman, aged eighty years; and he is now living and well. [See case 96.]

Still more rare is pure phosphate of lime. It is very hard, and breaks into angular or rhomboidal masses. [See case 175.]

We can and ought, then, in every case, before selecting the operation for its removal, to determine—

1. Whether a calculus is large, medium, or small, which can be done by measuring it by means of the lithotrite. Attention to the previous duration of symptoms will, of itself, afford some clue to the size, and, especially, if we are acquainted, from observation of the urine, with the chemical character of the stone. A pure uric acid calculus is slowly formed: so is oxalate of lime. Urate of soda concretes in a shorter space of time, the mixed form more quickly still; and the phosphatic are produced with greater rapidity than any.

2. Whether the calculus be hard or soft is determined by the click, or ring, obtained on striking it with the instrument in the bladder: clear and sonorous in the case of hard stones, and dull in that of soft ones.

3. Whether it is friable or compact in texture may be generally determined by ascertaining what is the persistent deposit in the urine during some days or weeks, if not previously known; from which one may almost certainly judge of the chemical nature, and hence of the physical structure, of the existing calculus, remembering, however, that phosphates are frequently present from irritation produced by acid calculi. But in very many cases, small calculi have been passed before, and their composition is known; and that which is in the bladder now will mostly be identical in kind.

4. It is necessary to ascertain whether there is one calculus only, or more than one, in the bladder, a matter of no little moment. It is exceedingly difficult, if not impossible, to determine this accurately with the simple sound, the signs afforded to it by multiple calculi being very deceptive. With the lithotrite it is easily determined. One calculus being seized, it is held between the blades

and the search is continued for a few moments with the stone in that position. If another is present, it is almost instantly struck either by the instrument, or by the stone already secured within its grasp. In this manner I have often verified the presence of a calculus on each side of the instrument as it lies in the bladder, showing the existence of at least three stones.

Having thus determined these particulars respecting the stone or stones, we are in possession of the first series of data which enable us to decide on the operation to be recommended.

The remaining series of data necessary, consists in the condition of the patient, local and general, and may be obtained under the following heads:—

1. Age.
2. Absence or presence of local disease.
3. His susceptibility to constitutional disturbance as a result of local irritation.

1. The age of the patient:—

This is a very important element in dealing with this subject. So much so that the early age of the patient, a few cases only excepted, may be held generally to decide the nature of the operation at once. By an early age I mean infancy and boyhood; or, to speak more exactly, from birth up to twelve or fourteen years.

At this period of life there is little temptation to employ Lithotrity, Lithotomy being very successful, and occasioning a mortality of only one in about sixteen cases under twelve years of age. Lithotrity has never approached these results for young subjects. But the propriety of employing it becomes a matter for consideration between fourteen and twenty, if the stone is not large, and is easily dealt with.

It becomes almost the rule subsequently, as far as to forty years of age, under the same condition. But, in general terms, the period which embraces all ages above twenty years, is essentially the period for crushing the stone; that during which we may derive the greatest aid from it; provided always, that some other considerations, which shall be discussed hereafter, are fully taken into account in dealing with individual cases.

These considerations arise from the analysis of the 1827 carefully reported Hospital cases, which are studied minutely, and at length, in Chapter VII., on the "Results of Lithotomy." But in order to show the prevalence of calculus at different periods of life, among the classes who form Hospital patients, the annexed table of that series is appended here, extending from the first to the eighty-first year of life.

Age of Patient. Years.	Number of Patients.
1	7
2	74
3	116
4	153
5	123
6	90
7	86
8	49
9	57
10	60
11	35
12	58
13	32
14	35
15	26
16	27
17	18
18	26
19	19
20	13
Carried forward	1104
Brought forward	1104
21	12
22	10
23	9
24	12
25	11
26	10
27	5
28	6
29	11
30	11
31	3
32	14
33	7
34	9
35	9
36	5
37	3
38	14
39	4
Carried forward	1269

Age of Patient. Years.	Number of Patients.
Brought forward	1269
40	21
41	4
42	7
43	11
44	4
45	17
46	11
47	15
48	6
49	10
50	23
51	15
52	11
53	17
54	25
55	23
56	26
57	25
58	16
59	22
60	33
Carried forward	1611
Brought forward	1611
61	17
62	22
63	22
64	16
65	26
66	20
67	14
68	17
69	8
70	16
71	8
72	5
73	4
74	2
75	9
76	4
77	0
78	1
79	0
80	4
81	1
Total	1827

The following facts appear from its analysis :—.

First. That one third of the entire number of cases occurs during the first six and a half or seven years of life.

Second. That one-half of the entire number occurs before the thirteenth year is completed.

Granting that Lithotomy should be employed in childhood and boyhood, as a rule to which there are few exceptions, it follows that this method must be applicable to fully one-half the entire number of calculous cases.

What is, then, the period of life when the individual is most liable to be affected with calculus? It has been common to answer in childhood. A very superficial glance at these figures might confirm some reader in this opinion. I believe, however, that it is the period between fifty and seventy years, and of this the latter half of the term especially. That is to say, the proportion of elderly calculous patients to the existing population at their own ages is larger than the proportion of children afflicted is to the number of existing children. This is the only accurate method of viewing the question. Calculus is most common between fifty and seventy; appears in the next degree of frequency between two and six years; and least frequently of all, perhaps, between twenty-six and thirty-six years—when, indeed, it is rare.

2. It is necessary to ascertain the absence or presence of local disease. Malignant disease of the bladder, for example, would generally be held to contra-indicate any operative interference: not necessarily so, however. One of my cases at University College was an instance in which intense suffering was greatly relieved by Lithotrity, and it apparently lengthened the patient's life. Such an instance is exceptional.

But by local disease here is mainly intended organic changes in the kidney; severe or persisting cystitis; enlargement of the prostate, and stricture of the urethra.

With regard to the first named, it is not very common to find calculus associated with those systemic changes which manifest themselves in the production of either fatty deposit, or those degenerations of structure commonly known as Bright's Disease, and the existence of which is evidenced by persistent albuminuria, renal casts in the urine, and, in advanced stages, by dropsical effusions in the cellular tissue, and in derangements of the cerebral functions. If such evidence is present, the stage of the disorder must guide us as to the propriety of entertaining the question of affording operative relief of any kind. For one case, No. 31 in the Lithotrity series in the

Appendix, life was made much more comfortable, and beyond doubt prolonged several months, by removal of a large phosphatic stone. The patient was in an advanced stage of Bright's Disease; he died within a year from the conclusion of the operation. Encouraged by this result, I operated in another, but probably more advanced case (No. 141) in University College Hospital, but death rapidly followed. The post-mortem showed both kidneys to be largely changed in structure. When the disease is in an advanced stage, no condition is more unpromising for the success of any operative procedure.

But there is another class of renal affections not to be confounded with these blood disorders, in which the organic change in the kidney results from pre-existing irritation of the bladder, or urethra. We commonly meet with patients, the subjects of chronic nephritis and pyelitis, who owe the existence of these complaints to an obstinate stricture, to chronic disease of the prostate, or to a calculus which has long remained in the bladder. We find in the most advanced cases of this kind, after death, the kidney diminished in size, the cortical substance especially so; interstitial deposits, and often small collections of pus in the renal substance, while the pelvis may be dilated, and, in some cases, is enormously so. Such are the results of mechanical distension from obstructive disease of the urethra and neck of the bladder, accompanied, as it always must be, more or less, by chronic inflammation extending up the urinary track. And it is with this type of disease that we have ordinarily to deal in discussing the question of operative procedure. Now the signs of this pathological state are not so clear as those which belong to the blood disorders above referred to. Furthermore, they cannot be distinctly isolated from the symptoms which belong to the urethral or vesical disease from which they derived their existence. They are not, by any means, to be discovered by urine-analysis; and their existence is to be inferred from symptoms which after all are by no means to be regarded as pathognomonic in their character. The patient complains of pains in the back and loins, and often in the groins and testicles; is probably tender on one or both sides on deep palpation through the abdominal muscles in the region of the kidney; is rather emaciated, and has gradually lost flesh; is weak and depressed, subject to chills and feverishness, amounting to rigors sometimes, after slight irritations, after the use of a catheter and the like. The urine is variable in its quantity and characters, and always contains pus, sometimes in great abundance. Still, we can by no means be certain from any signs or symptoms, that the changes described exist in any given case, and it is certain that they prejudice exceedingly the result of an operation. Examples are afforded by Nos. 61, 69, 127, 133, and 158, in the series of Lithotrity referred to.

3. This group of symptoms leads us insensibly to the next class of phenomena, viz., those which indicate considerable susceptibility to general disturbance from sources of local irritation, no organic disease whatever existing. There are many cases indicated in this division, in which extreme tendency to rigor exists, not on account of any existing renal implication, for, as before said, none may be present, but from some other and less obvious cause.

There are some constitutions, in which the nervous system appears to be so susceptible, as we express it, that almost any mechanical interference with the urethra, or bladder, is followed by startling symptoms obviously depending on some kind of shock propagated to the nervous centres, and consisting in syncope, rigor, vomiting, depression, with intense pains in the back, loins, and elsewhere. These, although alarming, are, generally, not dangerous, unlike those symptoms which, closely resembling them, depend on organic renal disease. Now, in none of these cases is it usually desirable to attempt the removal of a stone, unless it be a small one, by any method which requires repeated manipulation in the bladder or urethra. It is better, perhaps, to deal with it by one operation, than run the risk of several, and of the various minor difficulties which the removal of débris may involve.

Nevertheless, much more may be done with the last-named class than with the first. The cases belonging to it are improvable by general management, whereas those of the first steadily grow worse with time. And here we see, incidentally, the value of the preliminary treatment already referred to, and which may thus be briefly summed up :—

Preparatory treatment is important, in view of any operative procedure by Lithotomy or Lithotrity ; but especially is it desirable in certain exceptional cases to pass a few times sounds of gradually increasing calibre, to accustom the urethra and bladder to the contact of instruments, to lower its sensibility, and to increase its calibre, before the commencement of Lithotrity. But where the urethra is capacious, and its sensibility not great, such preliminary treatment is unnecessary.

By this practice we not only prepare the way for the passing of the lithotrite inwards and of fragments outwards, but if any undue excitability exists, its effects will be elicited in a minor degree by these preliminary measures before we have broken up the stone, and have become, perchance, committed, or nearly so, to the operation of Lithotrity. And in all cases, it is unwise to enter hastily on Lithotrity before this condition has been determined by the employment of means which are equally valuable, whether they act as preparatory to Lithotrity, or as a test for latent peculiarities in the constitution, which may contra-indicate it.

With these brief preliminary remarks, the way is now cleared for some final deductions relative to the operations to be employed in the various cases met with in practice.

1. For all cases of calculus during the periods of infancy, childhood, and boyhood, which may be regarded as from one to twelve or fourteen years, the following course appears to be the most judicious :—

To practise Lateral Lithotomy as the rule ; the mortality from which varies during this period from one in eleven to one in twenty-eight cases ; the mean of the whole being about one in fifteen cases.

The exceptional cases are those in which the stone is only a little too large to pass by the urethra, and therefore small. For these, there is no occasion to perform Lithotomy. Opposed as I am to Lithotrity in children, as a rule, for reasons already named, I nevertheless believe, when the stone is so small as to be easily pulverized by a single crush by a slender lithotrite, it is the simplest and best method of proceeding, and that when the stone can be well and easily crushed in one or two sittings, it is admissible.

With regard to Median Lithotomy in children, there appears to be no objection to it, provided a director or gorget conducts the finger into the bladder. At the same time, I do not know that it offers any advantage over the lateral operation.

2. In adult cases we have to decide between Lithotomy and Lithotrity; and if the former is indicated, to point out the particular form to be employed.

First, Lithotomy or Lithotrity?

The special indications for these operations must be considered as they relate to two separate classes of patients.

a. In tolerably strong and healthy adult patients.

b. In feeble and diseased adult patients.

This division is of more practical value than a division founded on age, because the influence of age is less strongly marked after manhood has been attained than before. If age be regarded alone, the period between twenty-five and forty years gives the best results, viz. one death in eleven and a half cases, from Lateral Lithotomy. But the data are comparatively few, since it is the period of all others when stone is most rare. The question of age and its effects in adults is therefore included in the major one of constitutional conditions.

1. In the class of healthy adults.

If the calculus is of small or of medium size, and single, whether it be soft, friable, or compact, and supposing it proved by preliminary examination that instrumental manipulations can be easily performed and are well borne, it should be crushed.

But the term "medium," here used in relation to size, although admitting of a little extension for calculi of uric acid and the urates, must be restricted quite within the limits assigned, for those of oxalate of lime: their spheroidal general outline makes a medium-sized calculus (one inch in diameter), quite large enough, if not rather too large, for Lithotrity.

If there is any special or exceptional ground for rejecting Lithotrity in such cases, the ordinary median operation may be employed. Indeed, these are the sole conditions, I believe, in which it is now advisable, since Lithotrity has rendered it for the most part an unnecessary proceeding. But when, as owing to the presence of a very narrow or unmanageable stricture, the crushing process is inapplicable, and the stone is small or of "small medium" size, this is perhaps the best mode of removing it, as we shall see further on. But, on the other hand, if the stone is large, and especially if it be also one of compact structure, the Lateral operation would generally be the best to select. For a large and friable stone Lithotrity may be successful, but such an one offering between twenty-five and forty years of age would probably be as well dealt with also by Lateral Lithotomy.

2. The question is to be considered for feeble and diseased patients.

a. Where there is no marked disease of the urinary organs, but feeble and failing strength :—

If the calculus is of small size and friable, and instrumental contact is well borne, there is no question that Lithotrity should be the operation selected. If of medium size, one would also incline to perform it, if possible, but if even hard and compact in structure, I doubt whether in these cases any form of Lithotomy would afford better results.

b. Where well-marked disease of some portion of the urinary organs exists.

In stricture of the urethra, especially if it has existed long, and is well marked, Lithotomy is preferable to Lithotrity if the calculus is large. But I have been able to accomplish so much recently by Lithotrity, for cases of stricture, by tying in a catheter [see page 237], that for small, and even medium-sized stones, the crushing process will often be found applicable. If, however, the stricture proves very unmanageable the Median operation may be selected, while its line of incision, being central, may be easily made to divide also the rigid tissues of the stricture.

In hypertrophied prostate, with a quiet condition of the bladder, Lithotrity is successful in small and medium-sized stones. But with an irritable condition of bladder, and with compact and *large* stones, Lateral Lithotomy seems preferable, and, in such, seems to be more successful than Median operations.

In cases where the bladder cannot expel its contents on account of loss of power in its coats, *i.e.* atony, and not on account of enlarged prostate, no objection lies, on that ground merely, against Lithotrity; indeed, such a condition is much more favourable to success than that of undue irritability of the organ. This is now known to most practical lithotritists, although it is a condition which, not long ago, was held to contra-indicate Lithotrity.

In marked disease of the bladder, cystitis with constitutional disturbance, tumours, simple or malignant, or if the existence of sacculi may be suspected, Lithotrity is more hazardous, so also is Lithotomy. But it cannot now be said that Lithotrity is inadmissible.

Finally, for cases of either class where the stone is of extremely large size, such as are now rarely met with, say from four ounces upwards, I doubt whether experience can indicate, on the whole, a safer method than the lateral operation, aided or not by a double incision of the prostate. It is in these circumstances that the apparatus of Civiale, for crushing a large stone before extracting, through the perineal wound, becomes applicable. For this purpose he preferred a central opening into the bladder, the Medio-bilateral operation; and I think, in order to work the plan efficiently, that such incisions may give a better chance to it than the Lateral.

The high operation offers, perhaps, as good a chance, if the bladder be distensible, and the patient is not corpulent. Data, however, are wanting to determine the value of this as well as that of the recto-vesical operation in relation to extremely large stones. Probably the latter might be regarded as the better procedure were it not for its liability to be followed by permanent fistula.

There is a question inevitably presenting itself sometimes, which is rarely dealt with by surgical writers, viz. should we ever refuse to perform an operation for the relief of the calculous patient, and if so, under what circumstances? In practice, this question must be answered; and the manner of answering it influences very much the rate of mortality resulting from operative proceedings. I think in England and in Scotland very few cases are rejected as unfit for operation, certainly in hospital practice; in private there are, from various causes, more examples of unremoved stone. So much may be done to mitigate suffering for those whose means enable them to command every resource available for the purpose, that the alternative of an operation, rendered hazardous by the magnitude of the calculus, or other unfavourable circumstance, is not necessarily adopted. It is widely otherwise with the poor, and it is sometimes a difficult point to determine whether continuous suffering or a severe operation involves the graver consequences to life. Mostly, the patient himself desires to turn the scale in favour of the latter alternative rather than be abandoned to the hopeless prospect of unrelieved suffering. In France a larger proportion of cases is, I think, rejected. Lithotomy is not so successful there, on comparing the results, in large numbers, of practice in the two countries; and the operation appears to me to be more dreaded by both surgeon and patient. It is more rarely performed, and thus it is, perhaps, that there seems to exist a want of that confident familiarity with Lithotomy which distinguishes the practised English operator, and which doubtless conduces to success. On the other hand, those who practise Lithotrity in France appear unwilling to hazard its application to very unpromising cases, and no doubt they act justly and prudently in so doing. Take, for example, the practice of M. Civiale, during the year 1862, which is a fair specimen of his usual experience, both before and since. He treated during that year sixty-nine calculous patients; sixty-six men, two women, and a child; forty-five in private practice; twenty-four at Hôpital Neckar. Fifty-eight of these were operated on: forty-five were submitted to Lithotrity; of these eight were partially cured: and it was successful in all the remainder but one.

Ten were treated by Lithotomy; three were cured, two relieved, and five died. Three were treated by a combination of Lithotomy and Lithotrity; two were cured, the other has incontinence of urine.

In *eleven cases* operative means have been adjourned or considered impossible.

Now, although the Lithotrity, as here recorded, is extremely successful, every English surgeon will feel surprised to find one in every six adult cases placed in the category last named, and one-half of the Lithotomy cases fatal. It must be obvious to all who are familiar with the practice of this country, that nothing like this proportion of cases is adjudged unfit for operation.

Are they, or are we, right in thus acting? Without entering upon a discussion of the numerous topics which the answer to this question might give rise to, I shall simply appeal to the results of English Lithotomy in the very worst cases, viz. those of large stone and broken-down constitution. If such an appeal shows that two out of three, or three-and-a-half, recover, and it does so, I think we are justified in offering that chance to a patient whose only other prospect is a lingering death, greatly aggravated in its misery if his circumstances are narrow. There is one condition, perhaps, which must be held as sufficient ground in a bad case, such as described above, for refusing to operate, and that is the presence of advanced renal disease; and when this can be affirmed to exist, I think it may be said that such a patient will certainly die, and that the surgeon is not justified in accelerating his fate. There are, however, a good many examples among us, in private practice particularly, although certainly less now (1870) than ten years ago, of patients who resolve not to risk any interference. I have had under my own care four patients, all at an advanced age, so greatly relieved by the daily use of the decoction of *Triticum repens*, that they have (in two of the cases I think unwisely) declined to submit to any operation. Certainly I have seen no circumstances in which that useful agent is more valuable than in those of calculus, sometimes when it is in the kidney, but especially when it is in the bladder, and I have received similar testimony from several of my professional brethren.

The foregoing observations, then, will be sufficient to enunciate the general principles which extended observation and experience indicate, in my opinion, to be our guides in selecting the proper procedure for given cases. Nevertheless, it is not presumed that every example can be brought to rule and measure, so to speak, and be mathematically fitted to the process requisite for it. Let it be well understood that they are held forth as principles to indicate the way, not as rigid laws knowing no exception. Since the last edition, I have in practice, as I have now by precept, extended somewhat the application of Lithotrity. I have pushed it as far as, with our present powers, appears to be prudent. Still it may be understood that, regarding only the mechanical power of instruments, still more is *possible* by that process. To this point I cannot advise that it should be employed. And this leads me to a most important remark: it is as follows:—*It must be our aim to reduce the stones to the process; that is, to detect them early, and consequently small, rather than to extend the process to large and compact stones.* It is true that a stone of that character may be removed, in certain exceptional cases, by Lithotrity, where great tolerance of manipulation by the bladder is exhibited. Among the series of Lithotrity cases in the Appendix, are several which weighed between one and two ounces, and were successfully removed. The subject was considered in the chapter devoted to "The Results of Lithotrity." But I may add here, that I believe that it is certainly true that an undue attempt to extend the province of Lithotrity beyond these limits will produce nothing but disaster.

I must now call attention to the advantage of discovering calculus in the early stage, of which several of these cases are examples. Many years ago I brought this subject forward at the Medical Society of London, reading five cases, with the view of illustrating what appears to me the great importance of this practice. For I do not hesitate to affirm that Lithotrity for a small, compact, or friable stone occurring in a tolerably healthy subject, devoid of unusual local susceptibility, at any age above puberty, is, if properly performed, an operation devoid of danger. Such a statement cannot be made of any other mode of operating for stone. In proof of this I am in a position to assert that, having now performed the operation some hundreds of times (1870), I have never lost a patient in whom the calculus was no larger than a small nut.

It follows then,—since every calculus is during a portion of its history small, and passes, generally, not very rapidly, through the early stages of formation; and since deteriorated health much more frequently succeeds to than accompanies its formation,—it follows, I repeat, that calculus of the bladder is removable, if its presence be early diagnosed, in almost every case, with little or no danger.

No proposition can be more logically incontrovertible than this: yet the practice of the past, so far as it depends on diagnosis, though steadily improving, has done so by slow and gradual degrees. Its truth, however, pregnant as it is with the happiest results for humanity, only requires to be known and acted on, in order to achieve at once a great advance, and one which I am sure is within our reach. In this department, as in every other of the wide domains of medicine and surgery, diagnosis is the one thing needful. That diagnosis is slowly reducing the size of the stone year by year, and has been doing so during some past time, is demonstrable from our museums. Take that of Norwich, for example, which is, thanks to the surgical genius of East Anglia, the most perfect and complete record, literally "graven in stone," that the world possesses of calculous experience! When the art of surgical diagnosis was young, the stone was often overlooked, until its large size and long existence precluded the possibility of the oversight continuing. Hence, among the stones removed there in the end of the last century, are seen masses which now most rarely come to light. I calculated the sizes presented during each consecutive ten years down to the present time, and noted the significant fact that they are gradually decreasing in size. In other words, it has been successively true at different periods, that the stone now is detected in an earlier stage of its existence than formerly.

	gr.
Thus the first, or earliest, 100 stones in the Norwich Museum have an average weight to each of	8·64
The second 100	7·07
The succeeding 400	5·95

But how much too late is still the stone detected? Ought any man, who complains of his symptoms, within reach of competent skill, to carry a stone in his bladder for more than twelve months, nay, more than eight, or six? And if detected thus early, if discovered when it assumes the size of a bean, or at most that of an almond, how often would it be necessary to lithotomize an adult? There can be no doubt that skill in diagnosis is greatly on the increase, and, from this fact, I may venture to foretell, without any pretension to the gift of prophecy, that year by year the stone will be detected sooner and sooner still, and that, therefore, "*pari passu*," Lithotomy will become less necessary, and Lithotrity more often applicable. Add to this the fact that the unchangeable conditions of anatomy leave little more to be effected, probably, in the mode of removing stone by the knife, while the improved application of mechanics to Lithotrity is, year by year, perfecting the process.

I say little here of chemical solvents in the treatment of already-formed calculus. In exceptional cases, they possibly may have been of some service. But their special application is to the earlier stage of the calculous diathesis, antecedent to true stone formation; for the solution of those particles which, aggregated, form the stone. For the action of solvents we require minute mechanical division of the material to be acted upon. And here we have it. It is but one step further still in the application of diagnostic science, which recognizes in the persistent undue deposit of crystalline material in the urine, and certain associated symptoms, that calculus-formation is imminent or impending; and internal solvents arrest the formation of precipitated deposit, while, which is much more important, the erring tendency of the economy is gradually corrected by medical treatment, diet, and hygiene.* But of this, enough; for the terms of my subject are purely surgical, and there is no further need that I overstep that imaginary line which is supposed to trace the confines of medicine and surgery. A subject which, nevertheless, illustrates well the important truth that no man can be a good practical surgeon who is not also an intelligent physician.

---

* This subject has since been pursued in another work, the "Clinical Lectures on Diseases of the Urinary Organs." Delivered at University College Hospital. 2nd edit. 1869. Churchill and Sons.

APPENDIX.

THE following is a brief report of 204 adult cases of Lithotrity, occurring consecutively in the author's practice during a period of seven years—from the autumn of 1863 to the autumn of 1870; not one patient has been omitted. The important details are given in each case, condensed from existing notes in full.

CASE 1.—A gentleman at Boulogne, æt. 65; seen in consultation with Dr. Perrochaud there. Two uric-acid stones, medium size. Six sittings, autumn, 1863. Success perfect.

CASE 2.—T. P—, æt. 59. University College Hospital. Uric-acid stone. Four sittings, autumn, 1863. Success perfect.

CASE 3.—P. B—, æt. 60. University College Hospital. Phosphatic stone, medium size. Bladder perfectly atonied. All urine removed by catheter for years past. Four sittings, autumn, 1863. Success perfect.

CASE 4.—A gentleman, æt. 45. Large phosphatic stone. Patient paraplegic. Bladder paralysed. Twelve sittings, autumn, 1863. Success perfect. Seen in consultation with Mr. T. W. Cowell.

CASE 5.—A gentleman, æt. 74. Uric-acid stone, medium size. Seven sittings, January and February, 1864. Seen by Mr. Clover, who gave him chloroform at the patient's special request at first sitting, but was not repeated. Success perfect.

Case 6.—A gentleman, æt. 69. Two uric-acid stones of considerable size. Eighteen sittings, spring, 1864. A patient of Mr. Gayleard, of Devonshire Street, who was present on every occasion. Success perfect.

Case 7.—A gentleman, æt. 70. Phosphatic stone, medium size. Five sittings, October, 1865. Eighteen months had elapsed since the patient had two large uric-acid stones removed. During the first twelve months following he had been free from symptoms. His prostate is remarkably large. Mr. Mapleson was in constant attendance with me. Success perfect.

Case 8.—A gentleman, æt. 45. Uric acid and urates, full medium size. Eight sittings, spring, 1864. Dr. Koepl, of Brussels, who was then in town, was present at two sittings. Success perfect.

Case 9.—A gentleman, æt. 69. Small uric-acid stone. Five sittings. The symptoms disappeared, and he returned home. A fortnight afterwards the patient called on me to complain of a little return of pain. I advised waiting a week or two before sounding. This was at the beginning of June. At the end of the month he had severe rigors and fever, no instruments having been used. He gradually sank in the middle of July. At the autopsy a calculus the size of a bean and smaller ones were found in the right kidney; in the left was a large abscess. In the bladder there were four calculi like those in the kidney, which had probably recently descended. The operation was incapable of removing the graver part of the malady, viz. that of the kidneys. Dr. Koepl was present at the first sitting.

Case 10.—A gentleman, æt. 46. Oxalate of lime, small medium size. Five sittings, spring, 1864. Dr. Pancoast, of Philadelphia, then in town, was present at one or two of the sittings. Success perfect.

Case 11.—A gentleman, æt. 70. Large mixed calculus. Eleven sittings, summer, 1864. All symptoms of stone disappeared. Some trouble remains with pre-existing enlarged prostate, but he rides, drives, and is actively engaged. Seen two or three times by Mr. M. B. Hill.

Case 12.—A gentleman, æt. 76. A smallish phosphatic stone. Five sittings, April and May, 1864. This case was seen by Sir William Jenner two or three times. Success perfect.

Case 13.—A gentleman, æt. 48. A medium-sized uric-acid stone. Six sittings. Mr. Hilton was present at one sitting. Success perfect.

Case 14.—A gentleman, æt. 69. Large uric-acid stone. Ten sittings, summer, 1864. Mr. M. B. Hill saw this patient frequently; my friend Mr. Norman, of Southsea, also on one occasion. Success perfect.

Case 15.—A gentleman, æt. 68. A rather small calculus, mixed. Five sittings, summer, 1864. Mr. Harris, of Gower Street, present at every sitting. Success perfect.

Case 16.—A gentleman, æt. 48. A rather large uric-acid stone. Eleven sittings, summer, 1864. Mr. Hilton was present at one or two sittings. Success perfect.

Case 17.—A gentleman, æt. 62. Small uric-acid stone. Three sittings, autumn, 1864. Mr. Hammerton was present each time. Success perfect. Has hunted ever since; 1870.

Case 18.—A gentleman, æt. 62. Large calculus, uric acid and urates. Thirteen sittings, autumn, 1864. Dr. Harley present at one sitting. Success perfect.

Case 19.—A gentleman, æt. 59. Small uric-acid stone. One sitting. Mr. Clippingdale saw this case with me in November, 1864. A subsequent severe illness, from which he slowly recovered; but he writes me now that he has "no return of the old complaint."

Case 20.—J. H—, æt. 59. University College Hospital. Rather small uric-acid stone. Eight sittings, November and December, 1864. The calculus could never be found or seized in any other way than with the blades of the lithotrite directed downwards immediately behind the prostate, however high the pelvis was raised. Discharged free from all symptoms.

Case 21.—A gentleman, æt. 75. A rather small phosphatic stone, broken up and removed at one sitting in December, 1864. Mr. Tatham, of Brighton, was present. The patient had long passed no urine except by catheter. This condition, of course, remains, minus the symptoms of stone.

Case 22.—A gentleman, æt. 77. Phosphatic stone. Three sittings. Same patient as No. 21, but eighteen months after previous stone. Successful.

Case 23.—A gentleman, æt. 58. A uric-acid stone of rather more than medium size. Five sittings, December, 1864. Mr. P. Jackson and the late Mr. C. Jackson, of Wimpole Street, were present at each sitting. Success perfect.

Case 24.—A gentleman, æt. 57. A small oxalate-of-lime calculus, crushed at one sitting in November, 1864. Mr. M. B. Hill was present. Successful as far as the removal of the stone is concerned. The patient is still subject to the formation of small calculi, which he has passed in great number.

Case 25.—A gentleman, æt. 84. Small uric-acid calculus. Five sittings, January, 1865. I had the pleasure of meeting in consultation Mr. Solly several times in this case. Success perfect.

Case 6.—A gentleman, æt. 60. He has passed all his urine by catheter for some years. Smallish phosphatic stone. Six sittings, January, 1865. Mr. Hill saw this case for me several times during a temporary absence. Success perfect.

Case 27.—The same patient, æt. 62. Crushed a second phosphatic stone in autumn, 1866. Three sittings. Since that small portions of phosphatic stone have been removed; but for one year he has been perfectly free from this affection, and is now (1870) in excellent health.

Case 28.—A gentleman, æt. 75. Phosphatic stone, medium size. Seven sittings, April and May, 1865. Prostate large; bladder has not been emptied without catheter for years. This case had the advantage of Mr. Aikin's constant care and attention. Success perfect.

Case 29.—The same gentleman. Had perfect immunity from stone for one year and a half, then symptoms reappeared, and I again removed a considerable stone in six sittings with perfect success.

Case 30.—A gentleman, æt. 61. Large uric-acid stone. Ten sittings, April and May, 1865. Dr. A. Simpson, of Glasgow, and Mr. M. B. Hill saw this case several times. Success perfect.

Case 31.—A gentleman, æt. 59. A large phosphatic stone; disease of kidneys. Eight sittings, April and May, 1865. A patient of Dr. Sharpe, of Norwood, who frequently saw him with me. Success perfect.

Case 32.—A gentleman, æt. 65. Rather small uric-acid stone. Four sittings, April and May, 1865. Seen by Mr. M. B. Hill, also by Dr. Van Buren, of New York. Success perfect.

Case 33.—A gentleman, æt. 53. Uric-acid stone, medium size. Eight sittings, April and May, 1865. Seen by Dr. A. Simpson, of Glasgow, and by others. Success perfect.

Case 34.—B—, æt. 62. University College Hospital. Small phosphatic stone. Three sittings, April and May, 1865. Recovered. About five months after, he died of cancer in the bladder. (See Hospital "Mirror," "Lancet," December 16, 1865.)

Case 35.—A gentleman, æt. 71. Two or three smallish uric-acid stones. Nine sittings, April, May, and June, 1865. All removed and greatly relieved, but now a tendency to deposit phosphates; removed by washing out the bladder. Often seen by Dr. A. Simpson and others.

Case 36.—A gentleman, æt. 70. Medium size phosphatic stone, with, perhaps, few urates. Five sittings. Very large prostate. Success perfect.

Case 37.—B—, æt. 28. University College Hospital. Hard phosphatic stone of medium size. Six sittings, May, 1865. Success perfect. (See the "Lancet," Hospital "Mirror," December 16, 1865.)

Case 38.—A gentleman, æt. 62. Rather small uric-acid stone. Three sittings, May, 1865. Seen by Mr. Clover, who gave chloroform. Success perfect.

Case 39.—A gentleman, æt. 74. Small medium uric-acid. Four sittings, May and June, 1865. Prostate very large. M. C. King, of Highbury, was in constant attendance with me. Success perfect.

Case 40.—A gentleman, æt. 70. Large uric-acid stone. Nine sittings, May and June, 1865. Prostate large. Mr. M. B. Hill watched this case constantly with me. Mr. Clover gave chloroform. Success perfect.

Case 41.—A gentleman, æt. 62. Medium sized uric-acid. Seven sittings, June and July, 1865. Stone completely removed. Greatly relieved, but some derangement of the bladder continues. Seen also several times by Mr. B. Hill.

Case 42.—A gentleman, æt. 61. Uric-acid, of medium size. Seven sittings, June and July, 1865. This patient was well known to Dr. Greenhow, who saw him occasionally. Success perfect.

Case 43.—B—, æt. 39. University College Hospital.

Small phosphatic stone. Three sittings, June and July, 1865. Sent to me by Dr. U. West, of Alford. Success perfect.

CASE 44.—A gentleman, æt. 69. Two calculi, medium size, mixed phosphates and urates. Seven sittings, June and July, 1865. Seen with me several times by Dr. Buchanan, of Glasgow. This patient had been cut in Edinburgh three years before, and two uric-acid stones removed, but smaller than the present. Success perfect.

CASE 45.—A gentleman, æt. 47. Phosphatic stone, medium size. Five sittings, September and October, 1865. The patient had been under the care of Mr. Rhind, of Shipley, Yorkshire, who advised him to undergo the operation. Success perfect.

CASE 46.—A gentleman, æt. 65. Uric-acid, of large medium size. Seven sittings, October, 1865. This patient was sent to me by Mr. Warwick, of Southwell. Success perfect.

CASE 47.—A gentleman, æt. 64. Uric-acid, of medium size. Four sittings, October, 1865. Seen by Mr. M. B. Hill, Dr. Seegen, of Vienna, and by others.

CASE 48.—A gentleman, æt. 65. Small, uric-acid. Two sittings, October, 1865, Mr. Clover gave chloroform. Success perfect.

CASE 49.—A gentleman, æt. 64. Medium size, hard, phosphatic stone. November and December, 1865. I stated at my first consultation with Mr. E. Wright, of Clapham, with whom I had the opportunity of frequently seeing this patient, that the case was unpromising, either for lithotomy or lithotrity; but that his symptoms being severe, I could not refuse the chance afforded by the latter operation. I also thought it necessary to make the same statement to his relatives before commencing. The prostate was exceedingly large, the cavity of the bladder small, and the stone difficult to seize. Besides this he had organic disease of the heart.

Without detailing all the particulars which were adverse to success in this case, I may say that it presented as many difficulties as any case which it has fallen to my lot to encounter. In Paris I am satisfied that this operation would have been declined; but his condition was so hopeless and so miserable without it, that I did not think it right to refuse him the chance. There were five sittings during the first month, conducted with the greatest care. Then fever set in; he gradually became weaker, and died suddenly while sitting up in bed and taking food, about a month after the last sitting, although he had rallied so much at times as to afford great hope of ultimate success. At the autopsy considerable suppuration was found about the base of the bladder. One half of the stone was removed, the other half remaining in the best condition—that is, in one piece, all the débris having been removed. I am satisfied to accept this as a death following the operation of lithotrity, although the actual cause of death at the last was clearly diseased heart, because the suppuration in the pelvis would have been almost necessarily fatal. It would have been politic to decline this case, but not right, I think, all things considered, to refuse the chance which the exercise of great care and gentleness in management might offer him, and I therefore consented. Had I not done so, there would not have been one fatal case; as it is, there is one out of twenty-four cases in this year. Reckoning the nineteen antecedent cases of 1864, it was the first death after a series of forty-three consecutive successful cases.

CASE 50.—A gentleman, æt. 66. Large, uric acid. Eight sittings, November and December, 1865. The patient was sent to me by Mr. Foster, of Huntingdon. The stone is completely removed, and its symptoms have disappeared. At present a good deal of irritation remains, with phosphatic deposit.

CASE 51.—A gentleman, æt. 59. Very large phosphatic stone. Eight sittings, December, 1865, and January, 1866.

Seen with me by Mr. W. Morris, of Petworth. Success perfect.

Case 52.—A gentleman, æt. 56. Two rather small uric-acid stones. Five sittings, December, 1865, January, 1866. Seen also by his medical man, Mr. W. Morris. Success perfect.

Case 53.—A gentleman, æt. 65. Several hard phosphatic stones; severe disease of bladder. Five sittings, January, 1866. Seen, with me, by Mr. Foster, of Huntingdon. Success perfect.

Case 54.—A gentleman, æt. 53. Stones, uric-acid and phosphatic mixed. Eight sittings. Disease of bladder, and tendency to produce phosphatic matter, subsequently for some months, Finally cured, and now in a state of comfort, January and February, 1866. Sent to me by the late Dr. Brinton, and known to Dr. Phillips, of Coventry.

Case 55.—A gentleman, æt. 67. Rather small uric-acid stone. Three sittings, January, 1866. Known to Mr. C. S. Webber. At this and several foregoing cases Dr. Mazanowski, of St. Petersburg, was present. Success perfect.

Case 56.—A gentleman, æt. 67. Large medium size uric-acid stone. Nine sittings, January and February, 1866. This case was seen throughout by Mr. John Foster, of Upper Wimpole Street. Success perfect.

Case 57.—A gentleman, æt. 66. Small uric-acid stone. Two sittings, January, 1866. Extreme fever following, from which he made a perfect recovery. He was seen throughout by his medical attendant, Dr. Monckton, of Maidstone.

Case 58.—A gentleman, æt. 63. Medium-sized uric-acid stone. Five sittings, February, 1866. Seen by Dr. Charles Mayo, and Dr. Taylor, of Guildford. Success perfect.

Case 59.—A gentleman, æt. 72. Large phosphatic stone. Six sittings, February, 1866. Seen, with me, by Mr. Charles Butler, of Ingatestone. Success perfect.

Case 60.—The same patient, about a year afterwards, applied with another stone, phosphatic, considerable size. Four sittings. He passes all his urine by catheter, and has had no return of the formation since (1870), and is in excellent health.

Case 61.—A gentleman, æt. 69, with very advanced disease of the bladder, and enormously enlarged prostate; but he was suffering so severely from several hard phosphatic stones, and with exhaustion therefrom, that I could not decline to make an attempt to remove them, notwithstanding his very unpromising condition. He gradually sank from debility. Seen throughout by Mr. W. S. Foster, of Newport.

Case 62.—A gentleman, æt, 74. Large uric-acid calculus. Six sittings, chiefly under the influence of chloroform, given by Mr. Clover, and much débris removed, March, 1866. Has hunted regularly this present season (1869). Success perfect.

Case 63.—A gentleman, æt. 56. Rather small uric-acid stone. Four sittings, March and April, 1866. Attended throughout by Mr. John Foster, of Upper Wimpole Street. Success perfect.

Case 64.—A gentleman, æt. 70. Several uric-acid stones. Six sittings, March and April, 1866. Seen, with me, by Dr. Radcliffe. Success perfect.

Case 65.—A gentleman, æt. 48. Phosphatic stone. Four sittings, March and April, 1866. This patient was seen, with me, by Dr. Hudson, of Cork Street. Success perfect.

Case 66.—A gentleman, æt. 67. Rather small uric-acid calculus. Four sittings, April, 1866. Seen, with me, by Dr. Owen Rees. Success perfect.

Case 67.—T. H—, æt. 49. University College Hospital. Two rather large uric-acid stones. Eight sittings, May and June, 1866. Success perfect.

Case 68.—D. E—, æt. 39. University College Hospital.

A large uric-acid stone. Seven sittings, June and July, 1866. Success perfect.

Case 69.—A gentleman, æt. 73, with a very large and hard uric-acid stone. He was very much averse to lithotomy, which would, perhaps, have been better for him; and I consented to crush the stone. It turned out to be even a little larger than I anticipated. It was entirely removed in several sittings, but he succumbed to fever and exhaustion from severe cystitis. June and July, 1866.

Case 70.—A gentleman, æt. 67. A medium size phosphatic stone. Renal disease existed, œdema of the legs, and advanced disease of the bladder. There was complete phymosis. The urethra was blocked with phosphatic débris, and the urine dribbled off involuntarily. I operated first on the urethra and cleared it, then crushed the stone, in five sittings, with perfect success. All his other symptoms have been greatly relieved since, and he has no trouble whatever now with the bladder or urethra, May and June, 1866. Seen, with me, by Mr. P. C. Chadwick, of Wrington. In 1869 he called on me in excellent health.

Case 71.—A gentleman, æt. 70. Five or six small uric-acid stones. Six sittings, June and July, 1866. Mr. Swaine, of Devonport, was present at one sitting. Success perfect.

Case 72.—A gentleman, æt. 55. Medium-sized hard phosphatic stone. Five sittings, July, 1866. Attended throughout by Mr. John Foster, of Upper Wimpole Street. Success perfect.

Case 73.—W. M—, æt. 40. University College Hospital. A man, with advanced renal disease, whose symptoms were aggravated by the presence of two or three phosphatic calculi in the bladder. These were removed in three sittings, July, 1866, and he left the hospital with his bladder free from calculous matter, and was so far relieved. He died from organic disease of the kidneys ultimately.

Case 74.—R. W—, æt. 52. University College Hospital. Enormously large and hard phosphatic stone. Fifteen sittings, October and November, 1866. He had been the subject of lithotomy before. Success perfect. Well in 1870.

Case 75.—A gentleman, æt. 76. Two uric-acid calculi of small medium size. Five sittings, October and November, 1866. Was also under the care of Mr. Blaker, of Brighton. Success perfect.

Case 76.—R. E—, æt. 60. University College Hospital. Mixed uric acid and phosphates. Four sittings, November, 1866. Success perfect.

Case 77.—A gentleman, æt. 54. Medium-sized uric-acid stone. Five sittings, November and December, 1866. Was also under the care of Dr. Lionel Beale. Success perfect.

Case 78.—A gentleman, æt. 75. Large uric-acid stone. Six sittings under chloroform, December, 1866. Was seen with me throughout by Dr. F. Davis, of Gower Street. Success perfect. I saw him quite well in 1869.

Case 79.—A lady, æt. 64. Uric-acid stone, rather small. Removed in two sittings, December, 1866. Seen with Dr. Owen Rees. Success perfect.

Case 80.—A gentleman, æt. 80. Uric-acid stone, full medium size. Four sittings, January, 1867. Notwithstanding his age he appeared to be a hale, strong man. After the second sitting severe cystitis came on, and he sank rapidly from exhaustion. Seen with Mr. Clover.

Case 81.—T. G—, æt. 70. University College Hospital. Mixed urates and phosphates. Five sittings, January, 1867. Discharged free from stone, but with much trouble resulting from enlarged prostate and irritable bladder.

Case 82.—A gentleman, æt. 69. Large phosphatic stone. Six sittings, spring, 1867. Much relieved, but a good deal of irritation of bladder continues. A similar calculus was crushed for him six years ago, and he has never been free from phosphatic deposit since. Seen in consultation with Dr. O. Rees.

Case 83.—A gentleman, æt. 61. Uric-acid stone, small medium size. Four sittings, spring, 1867. Sent to me by Dr. Seegen, of Carlsbad. Success perfect. I met him abroad and well in 1869.

Case 84.—A gentleman, æt. 63. Three or four smallish uric-acid stones. Five sittings, spring, 1867. Seen throughout by Mr. John Foster, of Upper Wimpole Street. Success perfect.

Case 85.—A gentleman, æt 57. Very large uric-acid calculus. Ten sittings, spring, 1867. Seen with Mr. R. Lamb, of Barnsbury. Success perfect.

Case 86.—Dr. C—, æt. 71. Medium size, phosphatic. Seven sittings, April and May, 1867. Success perfect.

Case 87.—A gentleman, æt. 59. Medium sized uric-acid. Two sittings, April, 1867. Pyæmia and death. He had two easy sittings within five days, without a bad symptom. Two days after, fever and swelling on right side of neck. In two days more breathing was difficult; next day pain in the abdomen; on the following day he died. An extremely large abscess was found deeply seated at the base of the neck, the result of pyæmia, and others were commencing elsewhere. Seen with Mr. Marshall, of Bedford Square.

Case 88.—A gentleman, æt. 77. Two or three small uric-acid stones. Six sittings, April and May, 1867. Seen with Mr. Newton, of Upper Wimpole Street. Success perfect. Living in good health, 1870.

Case 89.—A lady, æt. 42. A large phosphatic stone. Two sittings, May, 1867. With Dr. Meadows, of London. Success perfect.

Case 90.—A gentleman, æt. 64. Medium-sized uric-acid. Five sittings, May and June, 1867. Seen by Dr. Gibson, of Dundee. Success perfect.

CASE 91.—A gentleman, æt. 42. Small phosphatic. Two sittings, May, 1867. Operation for stricture at the same time. Mr. Clover gave chloroform. Success perfect.

CASE 92.—A gentleman, æt. 66. Small uric-acid. One sitting, May, 1867. Seen by Dr. Allen. Success perfect.

CASE 93.—A gentleman, æt. 35. Small phosphatic. Two sittings, June, 1867. Seen with Mr. Price, of Stamford Hill. Success perfect.

CASE 94.—A gentleman, æt. 61. Large uric-acid. Eight sittings, June and July, 1867. Seen by Dr. Heslop, of Birmingham. Success perfect.

CASE 95.—A gentleman, æt. 71. Numerous small uric-acid calculi, perhaps forty. Three sittings, July, 1867. Seen by Dr. Painter. Much relieved.

CASE 96.—A gentleman, æt. 81. Large cystic oxide. Nine sittings, July and August, 1867. This case has been seen by several of my professional brethren, the extreme rarity of the formation rendering it one of great interest. The success was perfect, and the gentleman is enjoying excellent health at the present time (1870).

CASE 97.—A gentleman, æt. 67. Rather small uric-acid. Four sittings, July, 1867. Success perfect.

CASE 98.—A gentleman, æt. 65. Two uric-acid stones. Six sittings, October, 1867. Sent by Dr. Thomas Keith, of Edinburgh. Success perfect.

CASE 99.—A gentleman, æt. 71. Small uric-acid. Four sittings, October, 1867. Mr. Clover gave chloroform. Success perfect.

CASE 100.—A gentleman, æt. 59. Three or four uric-acid stones, small. Six sittings, August, 1867. Seen by Dr. John Murray. Success perfect.

CASE 101.—A gentleman, æt. 57. Medium sized calculus, mixed phosphates and urates. Six or seven sittings, autumn, 1867. Relieved.

CASE 102.—A gentleman, æt. 60. Numerous rather small uric-acid calculi. Ten sittings, November and December, 1867. Seen by Dr. Nash, of Notting Hill. Success perfect.

CASE 103.—A gentleman, æt. 41. Small uric-acid. Three sittings, November, 1867. Mr. C. Heath was present at the first sitting. Success perfect.

CASE 104.—A gentleman, æt. 47. Large uric-acid. Nine sittings, December, 1867. Seen by Mr. Pritchard, of Retford. Success perfect.

CASE 105.—J. S—, æt. 55. University College Hospital. Mixed calculus, medium size. Five sittings, January, 1868. Success perfect.

CASE 106.—S. R—, æt. 50. University College Hospital. Rather small uric-acid. Six sittings, January and February, 1868. Success perfect.

CASE 107.—G. S—, æt. 51. University College Hospital. Large uric-acid. Nine sittings, February and March, 1868. Success perfect.

CASE 108.—E. B—, æt. 55. University College Hospital. Two medium size uric-acid. Eight sittings, January and February, 1868. Success perfect.

CASE 109.—A gentleman, æt. 68. Large uric-acid stone. This gentleman came from Paris, and was one of the most nervous and susceptible patients that I ever had to treat. I should have preferred to do lithotomy, but he would not listen to the proposal. I consented to crush, but towards the conclusion of the case, when nearly all the stone was removed, he sank from fever and exhaustion.

CASE 110.—A gentleman, æt. 58. Several small uric-acid calculi. Five sittings, February, 1868. He was the subject of stricture and also of diabetes. The calculi were successfully removed by means of a small lithotrite constructed for the purpose. Dr. Ringer gave chloroform.

Case 111.—A gentleman, æt. 76. Two uric-acid stones. Eight sittings, February and March, 1868. Sir Thomas Watson saw this case. Success perfect.

Case 112.—A gentleman, æt. 76. Rather small uric-acid stone. Four sittings, April, 1868. Success perfect.

Case 113.—J. K—, æt. 35. University College Hospital. Rather small uric-acid. Three sittings, April, 1868. Success perfect.

Case 114.—S. C—, æt. 58. University College Hospital. Medium-sized uric-acid. Five sittings, April and May, 1868. After the operation was finished, and he was awaiting only the final search for a last fragment, he caught cold, and had sore throat followed by œdema glottidis, for which laryngotomy was performed. He apparently recovered in a week's time, and the tube was removed. Ten days after this the œdema reappeared. The wound was reopened and the tube introduced; but he gradually sank in three or four days. The post-mortem examination showed the bladder to be perfectly healthy, and one tiny piece of débris only remained. This death cannot therefore be reckoned to lithotrity.

Case 115.—A gentleman, æt. 49. Medium-sized uric-acid. Five sittings, May, 1868. Dr. Keith, of Aberdeen, was present at one sitting. Success perfect. This case is the same as No. 8. He had no symptoms for three years. A new uric-acid stone has existed, according to symptoms, about twelve months.

Case 116.—A gentleman, æt. 62. Medium-sized uric-acid stone. Five sittings, May, 1868. Dr. Keith, of Aberdeen, present at one of the sittings. Success perfect.

Case 117.—A gentleman, æt. 65. Two rather large uric-acid stones. Thirteen sittings, June and July, 1868. Dr. Ringer gave chloroform. Success perfect.

CASE 118.—A gentleman, æt. 62. Several small uric-acid stones. Six sittings, June, 1868. Seen by Dr. Packman, of Ware. Success perfect.

CASE 119.—A gentleman, æt. 58. Medium-sized uric-acid. Five sittings, May and June, 1868. Seen by Mr. R. Phillips. Success perfect.

CASE 120.—A gentleman, æt. 60. Small oxalate-of-lime. One sitting, May, 1868. Seen with Mr. Aikin. Success perfect.

CASE 121.—A gentleman, æt. 59. Mixed uric-acid and phosphates. Five sittings, June and July, 1868. Seen by Mr. Aikin. Success perfect.

CASE 122.—A gentleman, æt. 71. A phosphatic stone, medium size. Four sittings, summer, 1868. The same patient as No. 82, for whom I crushed a stone two years before. He is liable to the formation of small phosphatic masses from time to time, which have to be removed, although otherwise now in good health (1870).

CASE 123.—A gentleman, æt. 73. Uric-acid, rather small size. Three sittings, April, 1868. Same case as No. 40. He had perfect freedom from all symptoms until about three months ago, when their reappearance led me to sound him, and I found a new formation, which has been removed with perfect success.

CASE 124.—A gentleman, æt. 70. Three uric acid stones, rather small. Six sittings, July, 1868. Seen by Dr. Gavin Milroy. Success perfect.

CASE 125.—Dr. P—, æt. 65. Uric-acid, rather small. Three sittings, July, 1868. Success perfect.

CASE 126.—G. B—, æt. 70. University College Hospital. Full medium-sized uric-acid, July, 1868. Two days after first crushing, much débris having been passed, he had a severe rigor. Next day complete suppression of urine for thirty hours. Urine then reappeared and was perfectly clear. On the next day rigors again, and two days after he died; the urine having continued perfectly clear up to the last. At the post-mortem examination the bladder was found free from any sign of inflammation; rather more than half the calculus in one piece was found there, the rest having been passed. One of the kidneys was healthy, the other showed marks of recent severe inflammation. No sign of disease elsewhere. I assume that this man rapidly succumbed to an acute attack of nephritis of one side. It is a remarkable circumstance, but not without parallel in my experience, that this state of the kidney should occur after an operation on the bladder, without any inflammation of that organ, the urine being clear to the last.

Case 127.—A gentleman, æt. 72. Large uric-acid stone. I decided to perform lithotrity in this case, although I now believe lithotomy would have been preferable. The size of the calculus was considered to be just within the reach of the crushing operation; a size for which it is impossible to say decisively beforehand which of the two operations was preferable. Under these circumstances the patient's strongly expressed wishes decided the question. During October I crushed seven times, the patient suffered severely in passing débris. At the end of the month he had a severe attack of suppression. It lasted 36 hours, then the urine became clear, and I have no doubt that the pathological condition much resembled that of the preceding case. He greatly improved, so that in November I crushed again, and disposed of nearly all the stone. He gradually sank and died a few days after. At the post-mortem examination the right kidney was found to be the subject of well-marked fatty degeneration, the left showed marks of recent inflammation, and contained an abscess. Two or three small fragments were found in the bladder. He had been under the care of Dr. Bayntun, of Bath.

Case 128.—A gentleman, æt. 58. Uric-acid stone. Four sittings, October, 1868. Seen with Mr. Price, of Dublin. Success perfect.

Case 129.—A gentleman, æt 52. Uric-acid. Small medium. Four sittings, October, 1868. Seen with Mr. Newnham, of Wolverhampton. Success perfect.

Case 130.—J. L—, æt. 63. University College Hospital. Uric-acid. Small medium. Seven sittings, October, 1868. The stone was successfully removed. A good deal of irritation remained, but this gradually subsided.

Case 131.—A gentleman, æt. 49. Rather large mixed urates and phosphate. Nine sittings, October and November, 1868. Seen with Dr. Macaldin, of Islington. Success perfect.

Case 132.—J. H—, æt. 63. University College Hospital. Uric-acid. Small medium-sized. Four sittings, October, 1868. Success perfect. Same case as No. 20, crushed four years before. Had immunity from symptoms three years; then formed a new uric-acid stone, of which he has had symptoms during the past year.

Case 133.—W. W—, æt. 65. University College Hospital. A large uric-acid stone. After ten sittings, during the months of October and November, 1868, by which the greater part of the stone was removed, he had much fever and cystitis. During the next fortnight he gradually sank. At the post-mortem the bladder showed marks of chronic inflammation. One kidney was tolerably healthy, the other was largely diseased, with deposits of pus in the pelvis and along the ureter to the kidney. The patient was feeble at first, or I should have performed lithotomy, which, after all, might have been the safer proceeding for a stone of this size.

Case 134.—A gentleman, æt. 61. Phosphatic stone, small medium size. Three sittings, October. 1868. Successful. This patient has passed all his urine by catheter for several months, and is the same as No. 102. He has a tendency to produce phosphatic matter in the bladder, and it is occasionally removed. The tendency is gradually diminishing, and he is in good health (1870).

CASE 135.—A gentleman, æt. 64. Several rather small uric-acid stones. Six sittings, October and November, 1868. Relieved. Subsequently, that is, five months afterwards, two small calculi removed by lithotomy with perfect success. Seen by Sir William Fergusson and others.

CASE 136.—A gentleman, æt. 51. Large uric-acid. Ten sittings, October and November, 1868. Seen with Dr. Langmore. Success perfect.

CASE 137.—A gentleman, æt. 73. Several rather small uric-acid stones. Eight sittings, October and November, 1868. Seen with Mr. Garlick, of Bloomsbury. Success perfect.

CASE 138.—A gentleman, æt. 68. Very feeble, requiring constant catheterism. Stone small medium. Mixed urates and oxalates. Five sittings, November, 1868. Seen with Mr. Barratt, of Welshpool. He made a good recovery and returned to the country, having learned to pass the catheter for himself. Subsequently he had severe fever, and shortly after died.

CASE 139.—A gentleman, æt. 59. Rather small uric-acid stone. Three sittings, December, 1868. A patient of Dr. Dansey, of Devonport. Success perfect.

CASE 140.—T. R—, æt. 29. University College Hospital. A large phosphatic stone; advanced disease of kidneys. This patient entered the hospital in a low condition of health. I dared not submit him to the knife, and resolved to offer him his only chance of temporary relief, by lithotrity. His case much resembled that of No. 31, in which I successfully relieved a patient with long-standing Bright's disease, of a large phosphatic stone, and who had nearly twelve months of comfortable existence afterwards. I made two small crushings in the end of November, 1868, and he passed some débris. But his condition did not encourage me to proceed, and I did not repeat the attempt. He had a large amount of albumen in the urine, and gradually sank in two or three weeks. At the post-mortem there were well-marked signs of chronic disease of one kidney, with abscess, chronic cystitis, and two large portions of phosphate of lime calculus in the bladder. The death must be attributed to the renal affection.

CASE 141.—A Turkish gentleman, from Constantinople, æt. 48. A medium-sized uric-acid stone. Five sittings, January and February, 1869. Seen with Mr. J. G. Forbes, of Hyde Park. Success perfect.

CASE 142.—A gentleman, æt. 67. Small medium uric-acid. Five sittings, February, 1869. Seen by Dr. M'Cleod, of Glasgow. Success perfect.

CASE 143.—A gentleman, æt. 32. Two small uric-acid stones. Three sittings, October, 1868. Mr. Newnham, of Wolverhampton, was present at one sitting. Success perfect.

CASE 144.—A gentleman, æt. 79. Two or three hard phosphatic calculi. Nine sittings, February and March, 1869. Seen with Mr. Tayloe, of Clapham. Success perfect.

CASE 145.—A gentleman, æt. 67. Three uric-acid calculi. Seven sittings, February, 1869. Seen in consultation with his medical attendant, Mr. Bostock, of Horsham. Success perfect.

CASE 146.—A gentleman, æt. 74. Uric-acid medium-size. Eight sittings, February and March, 1869. Conjointly under the care of Mr. Clover and myself. Success perfect.

CASE 147.—A gentleman æt. 62. Uric-acid, of rather small medium size. Seen in consultation with Dr. R. Mc Donnell, of Dublin. I crushed the stone easily and rapidly on the 31st of March, 1869. No frequency of micturition, or fever during the first three days. Appetite good, and in all respects well. At the end of that time he had an attack of rigors; urine was retained, became bloody, required the catheter, and in spite of unremitting attention he gradually sank with increasing fever, and died on April 17. There seemed to be a peculiar want of reparative power in this patient. To the last he ate and drank well of solid food, like a healthy man, but notwithstanding gradually and steadily declined. There was no autopsy.

CASE 148.—A gentleman, æt. 73. Two mixed calculi of considerable size; urates and oxalate of lime. Fourteen sittings, spring, 1869. Seen conjointly with Dr. O. C. Maurice, of Reading. Success perfect.

CASE 149.—A gentleman, æt. 78. Small medium, mixed urates and phosphates. Four sittings, April, 1869. Seen by Mr. Clover, who gave chloroform. Success perfect. The same patient as No. 99. He passed fresh uric-acid calculi, and had much phosphatic deposit with them. He has now been perfectly free for one year, and is quite well (1870).

CASE 150.—A gentleman, æt. 66. Large phosphatic stone. Seven sittings, spring, 1869. Dr. Ringer gave chloroform. Success perfect. The same patient as No. 117, a tendency to form phosphatic deposit after the first operation, which has since quite disappeared, and he is now perfectly well (1870).

CASE 151.—A gentleman, æt. 72. Rather small uric-acid stone. Five sittings, May, 1869. The general progress of this patient, seen in consultation with Mr. Macilwain, during the operation was satisfactory. He had a little fever, was occasionally rather low, and consequently each crushing was made as short as possible. He had an enormous prostate, which was in some degree disadvantageous for him. At the termination of the case some cerebral symptoms occurred, and I had the advantage of Dr. Owen Rees' opinion. No albuminuria was present. On the 1st of June symptoms of effusion on the brain suddenly appeared, and he died in a few hours. In this case it is impossible to consider the operation as the cause of death. That there had been cerebral changes of long standing little doubt could exist, and in so far as the operation weakened and disturbed the patient, its effect must have been prejudicial, but to this extent only can any casual relation be admitted.

Case 152.—A gentleman, æt. 56. Rather small uric-acid stone. Two sittings, May, 1869. Seen conjointly with Dr. Counor, of Battersea. Success perfect.

Case 153.—A gentleman, æt. 66. Several small uric-acid calculi, the aggregate being considerable. Seven sittings, June, 1869. Seen conjointly with Dr. Cribb, of Highbury. Success perfect.

Case 154.—A gentleman, æt. 76. Uric acid, small medium size. Four sittings, June, 1869. Seen conjointly with Sir William Fergusson. Success perfect.

Case 155.—J. W—, æt. 50. University College Hospital. Mixed calculus, uric-acid and phosphates, medium size. Four sittings, summer, 1869. Success perfect.

Case 156.—A gentleman, æt. 57. Rather small phosphatic. Two sittings, summer, 1869. I crushed an oxalate-of-lime calculus for this gentleman in 1864, with the late Mr. Ray, of Dulwich (Case No. 24). There had been no intermediate formation. Success perfect.

Case 157.—R. H. W—, æt. 26. University College Hospital. A man in the third stage of pthisis, with large cavities, was transferred from a medical ward to one of mine in June, 1869, with severe symptoms of stone. I found a small calculus, mixed oxalate-of-lime and uric-acid, which I crushed in two sittings. He was sent back, free from his urinary troubles, to the physician's ward, where I believe he ultimately died of pthisis.

Case 158.—A gentleman, æt. 55. Uric-acid stone of medium size. Six sittings, July, 1869. Seen conjointly with Sir Thomas Watson, Dr. Hassall, and others. Nothing apparently could be more promising than the aspect, the temperament, and condition of this patient at the commencement. The first two or three sittings were followed by slight and transient feverish attacks, but the urine gradually became charged with much blood and mucus, and this to an extent not easily to be accounted for. This condition seemed to be due to the presence of numerous sharp fragments, at the same time débris did not pass well by the natural efforts. Soon the patient became unable to pass more than a small quantity of urine by his own efforts, and catheterism several times a day became necessary. Meantime the patient, who took nourishment well, and was to a remarkable extent in stamina and disposition all that his surgeon could desire, gradually declined, and the local condition steadily got worse. The question arose whether the bladder should be at once emptied by lithotomy, or by crushing and with the use of Clover's instrument; and on this point I had the advantage of the opinion of my friend, Sir William Fergusson. We decided on the latter proceeding, and eventually the whole of the stone was removed in the middle of July. After this the patient continued very much in the same state, with a quick pulse, hectic flush, and using his own catheter, which he had learned to pass easily, several times in the twenty-four hours. At the end of the month he appeared to improve, and took drives in the open air, going to his country house on the 30th July. I saw him there next day; he took a little walking exercise, was cheerful, and looked better, but the quick pulse existed, and frequent catheterism was necessary, the urine secreted being remarkably large in quantity, but free from constitutional albumen or sugar. Day by day he became more exhausted, and he sank gradually on August 11th. There was no autopsy, but I have no question of the existence of considerable suppurative pyelitis on one or both sides, and probably of chronic inflammation affecting the kidney itself.

Case 159.—A Russian medical man, æt. 47. Uric-acid, medium-size. Five sittings. This gentleman travelled from a remote part of Siberia, for the purpose of the operation, and returned perfectly well after not quite four weeks residence in London. He was seen by several medical men here, who were interested in him as a brother practitioner.

Case 160.—A gentleman, æt. 60, a judge in California, who came to me for the operation. Large uric-acid. Seven sittings, July and August. Mr. Clover gave chloroform. This and the two previous patients were seen also by Dr. Stilling, of Hesse Cassel. Success perfect.

Case 161.—A gentleman, æt. 62. Uric-acid, small medium. A German gentleman of extremely irritable temperament, July, 1869. After the second crushing, he had a severe rigor, and soon after pyæmia with affection of the joints, and died in ten days. Seen with Dr. Bäumler, of Finsbury Place.

Case 162.—A gentleman, æt. 61. Uric-acid, medium size. Six sittings, October, 1869. He ultimately made a good recovery, rendered slow by severe orchitis. Sent to me by Dr. Savile, of East Retford.

Case 163.—A gentleman, æt. 52. Uric-acid, rather small. Five sittings, autumn, 1869. Success perfect.

Case 164.—A gentleman, æt. 61. Uric-acid, small medium. Four sittings, autumn, 1869. Seen with Mr. Ryott, of Newbury, who also saw the previous patient.

Case 165.—W. B—, æt. 65. University College Hospital. Large uric-acid stone. Nine sittings, October and November, 1869. Sent to me by Dr. Druitt, of Wimborne. Discharged cured, end of November.

Case 166.—W. L—, æt. 57. University College Hospital. Uric-acid, rather large. Nine sittings, October and November, 1869. Discharged convalescent in December, but with some irritation of the bladder. Returned to me in March, 1870, with a small phosphatic formation, which was rapidly removed. He is recovering by the daily use of injections into the bladder. Sent to me by Mr. Jalland, of Horncastle.

Case 167.—J. M—, æt. 69. University College Hospital. Urate of soda calculus, large. Seven sittings, October and

November, 1869. Sent to me by Dr. Canham, of Ramsgate. Success perfect.

Case 168.—W. W—, æt. 65. University College Hospital. Uric-acid, large medium. Eight sittings. Much fever and debility; discharged relieved, end of November, but in a very weak condition.

Case 169.—A gentleman, æt. 48. A medical man from the country. Urate of soda, medium size. Four sittings, November, 1869. The urgencies of practice compelled this patient to leave immediately after the last sitting, but successfully relieved of his calculus and with rapidly improving symptoms.

Case 170.—A gentleman, æt. 73. Rather small phosphatic calculus, crushed at one sitting, December, 1869. Mr. Clover gave chloroform. Success perfect.

Case 171.—A gentleman, æt. 75. Urate of soda. Calculus of large medium size. Removed in five large crushings under chloroform, December, 1869. Seen conjointly with Dr. Pavey. Success perfect.

Case 172.—A gentleman, æt. 59. A medical man from Ireland. Uric-acid, large medium. Six sittings, November and December, 1869. He was much relieved, but his professional duties removed him from my care much sooner than was desirable.

Case 173.—A gentleman, æt. 40. A medical man from the country. Uric-acid, small. Two sittings, November, 1869. Success perfect.

Case 174.—A gentleman, æt. 64. Mixed calculus, urates and phosphates. One sitting, greatly relieved; apparently cured, but patient declined further examination. Mr. Clover gave chloroform, summer, 1869. I heard from this patient in 1870, that he is now quite well.

Case 175.—A gentleman, æt. 35. Large calculus of pure phosphate of lime. Patient had formerly suffered from spinal disease, and recovered under the care of Mr. Brodhurst. Four sittings, December, 1869. Success perfect.

CASE 176.—A gentleman, æt. 69. Uric-acid, medium size. Five sittings, December, 1869. In consultation with Dr. Price Jones, of Surbiton. Success perfect.

CASE 177.—A gentleman, æt. 33. From Brussels. Small mixed calculus of peculiar formation, the basis being the triple phosphate with organic matter, mostly fat. Two sittings, December, 1869. There is a tendency at present for this material to reappear; but it is quite controlled by daily washing out the bladder. August, 1870, quite well.

CASE 178.—A gentleman, æt. 55. Uric-acid stone, medium size. Four sittings, January, 1870. Success perfect.

CASE 179.—A gentleman, æt. 73. Uric-acid, small medium size. Five sittings, January and February, 1870. Seen conjointly with Dr. Smith, of Little Hadham, Herts. Success perfect.

CASE 180.—A. R—, æt. 22. University College Hospital. Small oxalate-of-lime calculus. Two sittings, January, 1870. Success perfect.

CASE 181.—A gentleman, æt. 49. Uric-acid, small medium size. Five sittings, February, 1870. Seen conjointly with Mr. J. Storey, of London. Success perfect.

CASE 182.—A clergyman, æt. 65. University College Hospital. Two uric-acid calculi of medium size. Eight sittings, February and March, 1870. Treatment much delayed by extremely severe attacks of gout. Successful.

CASE 183.—A gentleman, æt. 74. Small uric-acid stone. Two sittings, January, 1870. Success perfect. I crushed a large stone for this gentleman a year ago. He was perfectly well until a fortnight before, when he had violent vomiting and pain in the back, announcing the descent of a fresh uric-acid calculus, about the size of a bean. Success perfect.

Case 184.—W. H—, æt. 57. University College Hospital. Uric-acid stone of medium size. Five sittings, spring, 1870. Success perfect.

Case 185.—A gentleman, æt. 63. Small medium urate of soda. Four sittings, May, 1860. Seen in consultation with Dr. Dobell. Success perfect as regards calculus, general health and strength excellent, but requires to use the catheter from time to time.

Case 186.—A gentleman, æt. 70. Numerous small uric-acid calculi. Has passed all his urine for last five years by catheter. Six sittings, May, 1870. Seen with Mr. Hill, of Stanhope Terrace, Bayswater. Success perfect.

Case 187.—A gentleman, æt. 61. Rather small uric-acid stone. Four sittings, May, 1870. Mr. Clover gave chloroform. Success perfect.

Case 188.—A gentleman, æt. 73. Medium size uric-acid. Four sittings, May, 1870. Sent to me by Dr. Jackson of Southsea. The stone was successfully removed, although the patient was in very feeble health, and required great care. He made a good recovery ultimately.

Case 189.—W. L—, æt. 58. University College Hospital. Phosphatic stone. Small medium. Three sittings, April, 1870. Success perfect. Same patient as No. 166. Taught to pass his catheter and wash out daily. This is a new formation, which will probably not recur, if he perseveres in doing so this time.

Case 190.—A gentleman, æt. 43. Small phosphatic stone. Two sittings, April, 1870. Mr. Clover gave chloroform. Same patient as No. 91 (1867). Had no symptoms of stone until three months ago.

Case 191.—A gentleman, æt. 72. Rather small uric-acid. Two sittings, June, 1870. Seen with Dr. Brace, of London, and Mr. Sloggett. Success perfect.

Case 192.—A gentleman, æt. 50. Large uric-acid stone.

Seven sittings, May, 1870. Seen by Mr. Dickenson, of Chelsea. Success perfect. Same patient as 104 (1867).

CASE 193.—A gentleman, aged 74. Very large uric-acid stone. Eight sittings, June, 1870. Seen constantly with Mr. Dickenson, of Chelsea. The stone was entirely removed, and to all appearances the case promised to be quite successful, and he was able to leave town for the sea-side. He had, however, phlebitis of one leg, and insidiously symptoms of pyæmia appeared, and proved fatal.

CASE 194.—A gentleman, æt. 81. Small phosphatic stone. Two sittings, July, 1870. Stricture of the urethra. Seen with Mr. Hilliard, of Shefford, Beds. Success perfect. This case affords a remarkable illustration of the possibility of applying Lithotrity successfully to calculus in the presence of stricture of the urethra, from which this gentleman had for years suffered. At first No. 6 only could be passed, but by tying in a gum-catheter for a few days No. 11 was reached. The patient was then put under chloroform, and as much as possible removed by the lithotrite on each occasion.

CASE 195.—A gentleman, æt. 65. Large phosphatic stone. Five sittings, June, 1870. For many years this gentleman has not emptied his bladder except by catheter, and the recurrence of calculus is the result of that condition. Although the stone was entirely removed on this occasion, painful chronic cystitis continued and phosphatic deposit slowly goes on, still removable by daily washing out the bladder. In such instances it often requires no little vigilance to prevent re-formation, and much suffering has to be endured. This condition, although existing for years, is sometimes recovered from; in others it terminates in fatal disease of the bladder. Seen by Mr. Dickenson and Mr. Harcourt of Philadelphia. Same patient as No. 51 (1865-6). Much better in December.

CASE 196.—A gentleman, æt. 28. Medium size phosphatic stone. Five sittings, July, 1870. Seen with Dr. Sibson. Successful.

CASE 197.—J. R—, æt. 60. University College Hospital. Medium size urate-of-soda calculus. Five sittings, July, 1870. Success perfect.

CASE 198.—J. W—, æt. 51. University College Hospital. Medium size phosphatic stone. Has not emptied bladder for some months, July, 1870. Successful. He was taught to pass his catheter and wash out his bladder daily. Same patient as 155 (1869).

CASE 199.—A gentleman, æt. 60. Small medium uric-acid stone. Two sittings, August, 1870. Seen by Dr. Roberts, of Port Madoc. Success perfect.

CASE 200.—A gentleman, æt. 46. Small urate-of-soda stone. August, 1870. One sitting. Success perfect.

CASE 201.—A gentleman, æt. 64. Full medium size uric-acid calculus. Five sittings, August and September, 1870. Seen in consultation with Mr. P. Jackson, of Wimpole Street. Same patient as No. 23 (1864). No symptoms until about one year ago. Success perfect.

CASE 202.—A gentleman, æt. 75. A great number of small uric-acid calculi, weighing an ounce or more. Six sittings, August and September. Mr. Clover gave chloroform. Success perfect. The same patient as No. 40 (1865), and No. 123 (1868). The only case in the series reported three times; since each operation was for large quantities of newly-produced uric-acid calculi, large and small, and was extremely formidable.

CASE 203.—A gentleman, æt. 51. Large phosphatic stone. Nine sittings, September, 1870. Sent by Dr. Blaikie, of Oswestry. Success perfect.

CASE 204.—R. C—, æt. 72. Two or three uric-acid stones, each of medium size. August, September, and October, 1870. Seventeen sittings, of which two were by Mr. B. Hill, and two by Mr. C. Heath, in my absence. Success perfect. The quantity removed equalled a large calculus.

INDEX.

PAGE
ADDENBROOKE'S Hospital cases . . 140
Adherent calculus 123
After-treatment : Lithotomy . . 47
,, ,, Lithotrity . . 216
Ages of stone patients . . . 142
Ages of 204 cases of Lithotrity . 251
Allarton's operation . . . 59, 147
Analysis of Lithotrity cases . . 251
Anatomy of perineum . . . 7
Angular staff 63
Anklets for Lithotomy . . . 21
Assistants in Lithotomy . . . 24
Atony of bladder 240

BELL (John) on the gorget . . 35
Bilateral operation . . . 55, 147
Birmingham Hospital cases . . 139
Bistouries cachées . . . 38, 56
Bladder before Lithotomy . . 24
,, ,, Lithotrity . . 178
,, atony of 240
,, sacculation of . . . 240
,, tumours of 242
Bleeding after Lithotomy . . 43
Blizard's knife 33
Brodie on first incision . . . 35
,, his knife 37
,, on small incisions . . 80
,, on spasm of the bladder . 122
,, his mode of seizing stone . 187
,, on removing débris . . 201
Brodie's cases of Lithotrity . 247, 250
Bryant (Mr. T.), cases from . . 139
Buchanan's operation . . . 63
,, ,, diagram of . 64

PAGE
CADGE (Mr.) on encysted calculus . 119
,, record of cases from 139, 147
Calculi left after Lithotomy . . 127
,, different modes of fracture . 272
,, of large size . 80, 108, 116
,, modes of removing . . 110
,, brittle 117
,, multiple . . . 117, 243
,, encysted . . . 118, 121
,, adhering 123
Calculus, recurrence of . . . 259
Case of encysted calculus . . 120
Cases of Lithotrity 293
,, of adhering calculus . . 124
Catheters, evacuating . . . 209
,, double current . . 211
Causes of death after Lithotomy . 76
,, ,, in children . 92
,, ,, Lithotrity . 254
Central operations 5
Characters of stone 271
Cheselden on injecting bladder . 24
,, on first incision . . 29
,, his gorget . . . 36
,, on dilating bladder . . 81
Children, Lithotomy for . . . 68
,, median operation for . 70
,, causes of death in . . 92
,, difficulties peculiar to . 99
,, Lithotrity for . . . 230
Chloroform in Lithotrity . . . 227
Choice of operation 265
Civiale on medio-bilateral Lithotomy 58
,, his lithotrite . . . 168

PAGE
Civiale on seizing the stone . . 188
,, his trilabe for exploring. . 206
,, his practice 247
Cline's gorget 36
Clover's apparatus 214
Compact calculi 271
Composition of calculi . . 264, 271
Conclusions final . . . 233, 265
Condition of patients after Lithotrity 257
Conditions necessary to Lithotrity . 178
,, ,, to a good lithotrite 162
Construction of lithotrites . 158, 160
Coulson on first incision . . . 29
Crichton on first incision . . . 29
,, his use of the gorget . 38, 109
,, on healing by first intention 49
,, on encysted calculus . . 120
,, on large calculi . . . 108
Crosse (Mr.) on Norwich Museum . 139
Crushing the stone in Lithotomy . 110
Cylindrical lithotrite 170, 185, 200, 204
Cystitis after Lithotomy . . . 87
,, ,, Lithotrity . . 224, 255

DANGER of violence in extracting 81–2
Death, causes of, after Lithotomy . 76
,, ,, in children . . 92
Débris left to nature . . . 198
Deep incision in Lithotomy . . 33
Details of lateral operation . . 17
Detecting the stone early . . 289
Diagnosis of sacculated bladder . 241
,, ,, stone 266
Diagrams of incisions :— . 31, 40
Lateral Lithotomy . . . 40
Bilateral Lithotomy . . . 57
Medio-Bilateral Lithotomy . . 59
Median Lithotomy . . . 60
Buchanan's operation . . . 62
Diagram of pelvic outlet . . . 9
Different modes of Lithotomy necessary 2
Difficulties in Lithotomy . . . 98
,, ,, infancy . . . 100
,, ,, old age . . 103
,, from malformation . . 106
,, ,, large stone . . 108

PAGE
Dilatability of neck of bladder . . 81
Dissection of pelvic outlet . . 13
Double-current catheters . . . 211
Double incision of the prostate 103–4

EARLY detection of the stone . . 289
Encysted calculi . . . 118, 121
English and French lithotrites 168, 170
Enlarged prostate in Lithotomy . 105
,, ,, ,, Lithotrity 177, 238
Erichsen on first incision . . 29
,, ,, causes of death . . 153
Evacuating catheters . . . 209
Exceptional position in Lithotrity 175, 176
Exploration of bladder . . 203, 269

FENESTRATED lithotrites . . . 159
Fergusson on first incision . . 29
,, remarks of 271 ; cases by 122, 145
,, his practice, results of . . 145
,, rack and pinion lithotrite . 196
,, on lithotrites . . . 171
Fever after Lithotrity . . . 223
Final conclusions 137
Fistula after Lithotomy . . . 130
Forceps for Lithotomy . . . 20
,, introduction of . . . 41
,, urethral 217
Foreign bodies in bladder . . 219
,, ,, ,, case of 220–22
,, ,, ,, instruments for 221–22
Form of pelvic outlet . . . 9
Fracture of calculi, modes of . . 272
Fragments in urethra . . . 216
French and English lithotrites 168, 170
Friable calculi 271

GLASGOW Infirmary . . . 138
Gorgets for Lithotomy . . 19, 36
,, history of 34
Granulation of the calculus . . 157
Gross on first incision . . . 29
,, his syringe 18
,, ,, compressing forceps . . 44
Gutteridge (Mr.), remarks by . . 135
Guy's Hospital cases . . . 139

PAGE
Hæmorrhage after Lithotomy . 43
,, death by . . . 91
,, and exhaustion . . 91
,, secondary . . 91, 129
,, after Lithotrity . . 225
Hair-pins in bladder . . . 220
Handling the lithotrite . . . 185
Hawkins (Chas.) on removing débris 201
Hawkins's gorget 36
Healing by first intention . . 49
Heurteloup 187
High operation 71
History of the gorget . . . 34
Holding the staff . . . 26, 28
Humphry (Dr.) on high operation . 148
,, ,, on care in extracting stone 84, 101
,, ,, on dangers in Lithotomy in children 101
,, ,, on encysted calculus . 119
Hunter's (John) knife . . . 37
Hussey (Mr.), cases from . . . 139
Hypertrophied prostate, Lithotomy in 105
,, ,, Lithotrity in 177, 238

Impaction of fragments . . 201, 216
Importance of preliminary treatment 151
Importance of finding stone early . 289
,, ,, diagnosis . . . 266
Improved screw lithotrite . . 168
,, ,, Charriére . . 168
,, ,, Coxeter . . . 169
,, ,, Weiss . 170, 185, 200
Incisions in Lateral Lithotomy 28, 33
Incontinence of urine . . . 132
Infiltration of urine after Lithotomy . 84
Influence of age 142
,, of disease 237
Injecting prior to Lithotomy . . 24
,, ,, ,, Lithotrity . . 178
Instruments for Lateral Lithotomy 17–22
,, ,, bilateral ,, . 56
,, ,, supra-pubic ,, 72–74
,, ,, Lithotrity . . 159
,, ,, foreign bodies. 221–2

PAGE
Insufficient incisions dangerous 80–83
Introduction of forceps . . . 41
,, ,, lithotrite . . . 181

Keith on first incision . . . 29
,, his gorget 37
,, careful use of forceps . . 83
,, his practice, results of . . 145
Key's operation 50
Knives for Lithotomy . . . 37

Langenbeck's knife . . . 32
Large calculi . . 43, 80, 108, 112
,, ,, difficult to detect . . 116
Lateral Lithotomy, 1827 cases, table of 140
Lateral and Central Lithotomy . 4, 54
Lawson (Mr.), case by . . . 120
Leeds Infirmary cases . . . 140
Leicester Infirmary cases . . . 140
Liston's knife 39
,, double incision of the prostate 103
Lithotomy, lateral 23
,, bilateral . . . 55
,, medio-bilateral . . 56
,, median 59
,, by angular staff . . 62
,, recto-vesical . . . 66
,, supra-pubic . . . 71
,, various forms of . . 68
,, without a stone . . 133
Lithotomes 38
Lithotrites, principles of constructing 158, 160
,, fenestrated . . . 159
,, non-fenestrated . . 162
,, old screw . . . 167
,, improved screw . . 168
,, cylindrical . 170, 185, 200
,, rack and pinion 166, 196
Lithotrity, rise of 149
,, treatment, preliminary . 157
,, for children . . . 230
,, for adults, healthy . . 173
,, ,, diseased . . 237
,, cases of 293
,, in cases of stricture . . 237

PAGE
Lithotrity in hypertrophied prostate . 238
,, in sacculated bladder . 240
,, in tumours of bladder . 242
,, in renal disease . 242, 254
,, with multiple calculi . 243

Male pelvic outlet 9
,, measurements . . . 10
,, dissection of . . . 12–14
Management of lithotrite in bladder 183–195
Martineau's practice . . . 80
Maxims in Lithotrity . . . 233
Measurements of pelvic outlet . . 10
Mechanical violence, its dangers 78–82
Median operation 59
,, cases of . . 147
Medio-bilateral operation . . 56
Mercier's evacuating catheter . . 212
Minor varieties of Lithotomy . . 68
Mode of seizing the stone . . . 187
,, crushing the stone . . 192
,, introducing lithotrite . . 181
,, employing cylindrical lithotrite 184, 200, 204
,, sounding for stone . . 270
Mortality after Lateral Lithotomy . 143
,, at different ages . . 142
,, in children . . . 92
,, after Median Lithotomy . 147
,, ,, Buchanan's operation 147
,, ,, bilateral ,, 147
,, ,, recto-vesical ,, 148
,, ,, supra-pubic ,, 148
,, ,, Lithotrity . . 247
Multiple calculi . . . 117, 243
Museum of College of Surgeons 122, 124
,, ,, of Norwich . . 290

Neck of bladder very dilatable . . 81
No stone discovered at operation . 133
Non-fenestrated lithotrites . . 163
Norwich Hospital cases . . 139, 140
,, Museum 290
Nunneley (Mr.), cases from . . 139

Objects of Lithotrity . . . 156
Old screw lithotrite 167
Operating table 23

PAGE
Ordinary position in Lithotrity . . 174
Origin of lateral operation . . 5

Paget (Mr. Thos.), remarks by . 135
,, ,, cases from . . 140
Parallelism of incisions . . . 40
Parts cut in Lateral Lithotomy . . 15
,, central ,, . . 15
Parts avoided in Lateral Lithotomy . 14
,, central ,, . 16
Pemberton (Mr.), cases from . . 139
Perforated lithotrite . . . 205
Peritonitis in children . . 93, 95
Phlebitis and pyæmia . . . 90
Pince à trois branches . . . 206
Poisonous absorption after Lithotomy 89
Position of hands in last incision . 31
Position in Lithotrity . . . 173
,, ,, ordinary . 173, 174
,, ,, exceptional 175, 176
Pouteau on careful use of forceps . 83
Practical maxims in Lithotrity . . 233
Preliminary treatment, Lithotomy . 23
,, ,, Lithotrity . 157
Prichard (Mr.), his anklets . 21, 27
Probe-pointed knives . 19, 33, 39
Prostate, size of, in children . . 96
,, gland, portions removed . 126
,, rigidity of . . . 103
Prostatic disease, Lithotrity in . . 238
Pulverising the fragments . 157, 200
Pyæmia following Lithotrity . . 256
Pyelitis (chronic) and Lithotrity . 255

Rack and pinion lithotrite . 166, 196
,, ,, by Matthews . . 166
Radcliffe Infirmary cases . . . 139
Rates of mortality 142
Recovery rate after Lithotrity . . 254
Recto-vesical operation . . 6, 66
Rectum, wound of 125
Recurrence of calculus . . . 259
Reduction of stone to powder . . 200
Refusal to operate 253
Removal of débris 207
,, last fragments . . 203
,, portion of prostate . . 126
,, foreign bodies . . 219

PAGE
Renal disease and Lithotrity . 242, 254
Results of Lithotomy . 137
,, Lithotrity . 245
Retention after Lithotrity . 226
Rigidity of prostate . 103

SACCULATED bladder, operation for stone in . 240, 257
Safety of Lithotrity . 263
Scarpa's gorget . 36
Scoop lithotrites . 159
Small lithotrites for fragments .
Secondary hæmorrhage . 91, 129
Seizing the stone . 183
Sexual impotence . 131
Shock, death by . 90, 97
Situation of calculus . 194
,, incisions in Lateral Lithotomy . 29
Skey on first incision . 29
Slipping of the gorget . 34
Smith (of Leeds), his knife . 37
Solvents of stone . 291
Sound, best form of . 270
Sounding for stone . 269
Sounds for detecting stone . 17, 270
,, the bladder . 17, 270
Spasm of the bladder . 122

PAGE
St. Thomas's Hospital cases . 140
Staffs for Lithotomy . 18
,, the straight . 50
Stone to be struck with the staff . 25
Stricture and stone . 237
Supra-pubic Lithotomy . 71
,, results of . 148

TABLE of 1827 cases . 140, 142
Tenaculum . 22, 44
Tetanus . 92
Tonicity of bladder . 180
Treatment after Lithotomy . 47
,, Lithotrity . 216
Triticum repens, value of . 225
Tube for Lithotomy . 22, 46, 48
Tumours of the bladder . 242

UNIVERSITY College Hospital cases . 140
Urethral forceps . 217
,, lithotrite . 218
Urinary infiltration after Lithotomy . 84
Urine, retention of . 226

WHEN not to operate . 253
Wormald (Mr.), case by . 124
Wound of the rectum . 125

Woodfall and Kinder, Printers, Milford Lane, Strand, London, W.C.

London, New Burlington Street,
April, 1872.

MESSRS. J. & A. CHURCHILL'S

Publications,

IN

MEDICINE

AND THE VARIOUS BRANCHES OF

NATURAL SCIENCE.

"It would be unjust to conclude this notice without saying a few words in favour of Mr. Churchill, from whom the profession is receiving, it may be truly said, the most beautiful series of Illustrated Medical Works which has ever been published."—*Lancet.*

"All the publications of Mr. Churchill are prepared with so much taste and neatness, that it is superfluous to speak of them in terms of commendation."—*Edinburgh Medical and Surgical Journal.*

"No one is more distinguished for the elegance and *recherché* style of his publications than Mr. Churchill."—*Provincial Medical Journal.*

"The name of Churchill has long been a guarantee for the excellence of illustrated works, and it would be superfluous to repeat the admiration that we have several times expressed in this respect, of the spirit with which this firm engages in these costly but valuable series."—*Medical Press and Circular.*

"The typography, illustrations, and getting up are, in all Mr. Churchill's publications, most beautiful."—*Monthly Journal of Medical Science.*

"Mr. Churchill's illustrated works are among the best that emanate from the Medical Press."—*Medical Times.*

"We have before called the attention of both students and practitioners to the great advantage which Mr. Churchill has conferred on the profession, in the issue, at such a moderate cost, of works so highly creditable in point of artistic execution and scientific merit."—*Dublin Quarterly Journal.*

MESSRS. J. & A. CHURCHILL are the Publishers of the following Periodicals, offering to Authors a wide extent of Literary Announcement, and a Medium of Advertisement, addressed to all Classes of the Profession.

THE BRITISH AND FOREIGN MEDICO-CHIRURGICAL REVIEW, AND QUARTERLY JOURNAL OF PRACTICAL MEDICINE AND SURGERY.

Price Six Shillings. No. XCVIII.

THE QUARTERLY JOURNAL OF MICROSCOPICAL SCIENCE,

Edited by J. F. PAYNE, B.Sc., M.B., and E. RAY LANKESTER, B.A., F.R.M.S. Price 4*s.*
No. XLVI. *New Series.*

THE JOURNAL OF MENTAL SCIENCE.

By authority of the Medico-Psychological Association.
Edited by HENRY MAUDSLEY, M.D., and JOHN SIBBALD, M.D.
Published Quarterly, price 3*s.* 6*d.* *New Series.* No. XLV.

ARCHIVES OF MEDICINE:

A Record of Practical Observations and Anatomical and Chemical Researches, connected with the Investigation and Treatment of Disease. Edited by Dr. LIONEL S. BEALE, F.R.S. No. XVII., 3*s.*

THE MEDICAL DIRECTORY.

Published Annually. 8vo. 10*s.* 6*d.*

THE YEAR-BOOK OF PHARMACY,

Published Annually. 8vo., 7*s.* 6*d.*

THE ROYAL LONDON OPHTHALMIC HOSPITAL REPORTS, AND JOURNAL OF OPHTHALMIC MEDICINE AND SURGERY.

Vol. VII., Part 2, 2*s.* 6*d.*

THE MEDICAL TIMES & GAZETTE.

Published Weekly, price Sixpence.
Annual Subscription, £1. 6*s.*, and regularly forwarded to all parts of the Kingdom, post free, for £1. 8*s.*

THE PHARMACEUTICAL JOURNAL, AND TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY.

Published Weekly, price Fourpence.
⁂ May also be had in Monthly Parts.

THE BRITISH JOURNAL OF DENTAL SCIENCE.

Published Monthly, price One Shilling.
No. CLXXXVII.

THE HALF-YEARLY ABSTRACT OF THE MEDICAL SCIENCES.

Being a Digest of British and Continental Medicine, and of the Progress of Medicine and the Collateral Sciences. Edited by W. DOMETT STONE, M.D., F.R.C.S. (Exam.). Post 8vo., 6*s.* 6*d.* Vols. I. to LIV.

MESSRS. CHURCHILL have concluded a special arrangement with MESSRS. LINDSAY & BLAKISTON, OF PHILADELPHIA, in accordance with which that Firm will act as their Agents for the United States of America, either keeping in Stock most of Messrs. CHURCHILL'S Books, or reprinting them on Terms advantageous to Authors. Many of the Works in this Catalogue may therefore be easily obtained in America.

A CLASSIFIED INDEX

TO

MESSRS. J. & A. CHURCHILL'S CATALOGUE.

ANATOMY.

	PAGE
Anatomical Remembrancer ..	7
Flower on Nerves	16
Heale's Anatomy of the Lungs	19
Heath's Practical Anatomy ..	20
Holden's Human Osteology ..	20
Do. on Dissections	20
Jones' and Sieveking's Pathological Anatomy	22
Maclise's Surgical Anatomy ..	25
Sibson's Medical Anatomy ..	33
Waters' Anatomy of Lung ..	37
Wilson's Anatomy	39

CHEMISTRY.

Bernays' Notes for Students ..	9
Bloxam's Chemistry	10
Do. Laboratory Teaching	10
Bowman's Practical Chemistry	10
Do. Medical do. ..	10
Brown's Analytical Tables ..	11
Fownes' Manual of Chemistry ..	16
Do. Actonian Prize	16
Do. Qualitative Analysis ..	16
Fresenius' Chemical Analysis ..	17
Galloway's First Step	17
Do. Second Step	17
Do. Analysis	17
Do. Tables	17
Griffiths' Four Seasons	18
Horsley's Chem. Philosophy ..	21
Kay-Shuttleworth's Modern Chemistry	23
Mulder on the Chemistry of Wine	27
Speer's Pathol. Chemistry ..	34
Sutton's Volumetric Analysis .	34
Valentin's Laboratory Text-Book	37

CLIMATE and BATHS.

Bennet's Winter in the South of Europe	9
Chambers on Italy	12
Cutler on Spa	14
Dalrymple on Egypt	14
Francis on Change of Climate ..	16
Grabham on Madeira	18
Hall on Torquay	19
Haviland on Climate	19
Horton on West Coast of Africa	21
Kennion on Harrogate	23
Martin on Tropical Climates ..	26
Moore's Diseases of India ..	26
Patterson's Egypt and the Nile	28
Scoresby-Jackson's Climatology	32
Shapter on South Devon	32
Siordet on Mentone	33
Taylor on Pau and Pyrenees ..	35

DEFORMITIES, &c.

	PAGE
Adams on Spinal Curvature ..	6
Do. on Clubfoot	6
Bigg's Orthopraxy	9
Bishop on Deformities	10
Do. Articulate Sounds ..	10
Brodhurst on Deformities ..	11
Do. on Clubfoot	11
Do. on Spine	11
Coles on Deformities of the Mouth	13
Hugman on Hip Joint	21

GENERATIVE ORGANS, Diseases of, and SYPHILIS.

Acton on Reproductive Organs	6
Coulson on Syphilis	14
Gant on Bladder	17
Hutchinson on Inherited Syphilis	22
Oppert on Syphilis	27
Parker on Syphilis	28
Wilson on Syphilis	39

HYGIENE.

Armstrong on Naval Hygiene	7
Chavasse's Advice to a Mother ..	13
Do. Counsel to do... ..	13
Do. Advice to a Wife ..	13
Dobell's Germs and Vestiges of Disease	15
Godfrey on Hair	18
Gordon on Army Hygiene ..	18
Hartwig on Sea Bathing	19
Hartwig on Physical Education	19
Hufeland's Art of prolonging Life	21
Hunter on Body and Mind ..	21
Lowndes on the Maintenance of Health	25
Moore's Health in Tropics ..	26
Parkes on Hygiene	28
Pickford on Hygiene	29
Robertson on Diet	31
Routh on Infant Feeding	31
Turner's Manual of Diet	36
Wells' Seamen's Medicine Chest	38
Wilson on Healthy Skin	39
Do. on Mineral Waters ..	39
Do. on Turkish Bath	39

MATERIA MEDICA and PHARMACY.

Beasley's Formulary	9
Do. Receipt Book	9
Do. Book of Prescriptions	9
Birch on Oxygen	9

MATERIA MEDICA and PHARMACY—*continued.*

	PAGE
Brunton on Digitalis	11
Lescher's Elements of Pharmacy	24
Nevins' Analysis of Pharmacop.	27
Pereira's Selecta è Præscriptis	28
Prescriber's Pharmacopœia ..	29
Rogers on Therapeutics	31
Royle's Materia Medica	31
Smith's Pharmaceutical Guide	33
Squire's Hospital Pharmacopæias	34
Do. Companion to the Pharmacopæia	34
Steggall's First Lines for Chemists and Druggists	34
Stowe's Toxicological Chart ..	34
Taylor on Poisons	35
Wahltuch's Materia Medica ..	37
Waring's Therapeutics	37
Wittstein's Pharmacy	38

MEDICINE.

Adams on Rheumatic Gout ..	6
Addison on Cell Therapeutics ..	6
Do. on Healthy and Diseased Structure	6
Aldis's Hospital Practice	6
Anderson on Leprosy	7
Barclay on Medical Diagnosis ..	7
Do. on Gout	7
Barlow's Practice of Medicine	8
Basham on Dropsy	8
Bennett on Cancerous Growths	9
Braidwood on Pyæmia	10
Brinton on Stomach	11
Do. on Intestinal Obstruction	11
Budd on the Liver	12
Budd on Stomach	11
Camplin on Diabetes	12
Chambers on the Indigestions	12
Do. Lectures	12
Cobbold on Worms	13
Dale's Practical Medicine	14
Davey's Ganglionic Nervous Syst.	14
Day's Clinical Histories	15
Elam on Medicine, Disease, and Death	15
Eyre on Stomach	15
Fenwick on the Stomach	16
Do. on Diagnosis	16
Foster's Method and Medicine	16
Fuller on Rheumatism	16
Gibb on Laryngoscope	17
Habershon on the Abdomen ..	18
Do. on Mercury	18
Hall (Marshall) on Apnœa ..	18
Do. Observations ..	18
Headland—Action of Medicines	19
Do. Medical Handbook	19
Hood on Gout and Rheumatism	21
Hooper's Physician's Vade-Mecum	18
Inman's New Theory	22

MEDICINE—*continued.*

PAGE
James on Laryngoscope 22
Jones (Bence) on Pathology and Therapeutics 22
Mackenzie on Throat Diseases . 25
MacLeod on Acholic Diseases .. 25
Macleod's Ben Rhydding 25
Macnamara on Cholera 25
Marcet on Chronic Alcoholism . 25
Macpherson on Cholera 26
Martyn on Hooping Cough .. 26
Meryon on Paralysis 26
Morris on Germinal Matter .. 27
Mushet on Apoplexy 27
Parkin on Cholera 28
Pavy on Diabetes 28
Do. on Digestion 28
Reynolds' Uses of Electricity .. 30
Richardson's Discourses 30
Roberts on Palsy 31
Robertson on Gout 31
Savory's Domestic Medicine .. 32
Semple on Cough 32
Shaw's Medical Remembrancer 32
Smee on Debility 33
Squire on Temperatures 34
Steggall's Medical Manual .. 34
Thomas' Practice of Physic .. 35
Thudichum on Gall Stones .. 35
Todd's Clinical Lectures 36
Tweedie on Continued Fevers 36
Walker on Diphtheria 37
What to Observe at the Bedside 25
Wright on Headaches 39

MICROSCOPE.

Beale on Microscope in Medicine 8
Carpenter on Microscope 12
Schacht on do. 32

MISCELLANEOUS.

Acton on Prostitution 6
Barclay's Medical Errors 7
Bascome on Epidemics 8
Beale on Disease Germs 8
Buckle's Hospital Statistics .. 11
Chapman's Med. Institutions .. 12
Cooley's Cyclopædia 13
Davies on the Unity of Medicine 14
Gaskoin's De Villalobos 17
Glenn's Laws affecting Medical Men 18
Gordon on China 18
Graves' Physiology and Medicine 18
Guy's Hospital Reports 18
Harrison on Lead in Water .. 19
Howe on Epidemics 21
London Hospital Reports. .. 24
Mayne's Medical Vocabulary .. 26
Oppert on Hospitals 27
Part's Case Book 28
St. George's Hospital Reports .. 31
St. Thomas's do. do. .. 31
Snow on Chloroform 33
Veitch on Sick Nursing 37

MISCELLANEOUS—*continued.*

Waring's Tropical Resident at Home 37
Whitehead on Transmission .. 38
Wise's Med. amongst Asiatics .. 38
Wolff on Zymotic Diseases .. 39

NERVOUS DISORDERS AND INDIGESTION.

PAGE
Althaus on Epilepsy, Hysteria, &c. 7
Birch on Constipation 9
Downing on Neuralgia 15
Jones (Handfield) on Functional Nervous Disorders 22
Leared on Imperfect Digestion 24
Morris on Irritability 26
Reade on Syphilitic Affections of the Nervous System 30
Reynolds on the Brain 30
Do. on Epilepsy 30
Rowe on Nervous Diseases .. 31
Sieveking on Epilepsy 33
Turnbull on Stomach 36

OBSTETRICS.

Barnes on Obstetric Operations 8
Hodges on Puerperal Convulsions 20
Lee's Consultations in Midwifery 24
Leishman's Mechanism of Parturition 24
Pretty's Aids during Labour .. 29
Priestley on Gravid Uterus .. 30
Ramsbotham's Obstetrics 30
Sinclair & Johnston's Midwifery 33
Smellie's Obstetric Plates 33
Smith's Manual of Obstetrics .. 33
Swayne's Aphorisms 34
Tanner's Practical Midwifery .. 35
Waller's Midwifery 37

OPHTHALMOLOGY.

Cooper on Injuries of Eye .. 31
Do. on Near Sight 13
Dalrymple on Eye 14
Dixon on the Eye 15
Jago on Entoptics 22
Jones' Ophthalmic Medicine .. 23
Do. Defects of Sight 23
Do. Eye and Ear 23
Liebreich's Atlas of Ophthalmoscopy 24
Macnamara on the Eye 25
Power's Illustrations of Diseases of the Eye 29
Walton on the Eye 37
Wells Treatise on the Eye .. 38
Do. on Spectacles 38

PHYSIOLOGY.

Beale on Protoplasm 8
Do. Life Theories 8
Carpenter's Human 12
Do. Manual 12
Heale on Vital Causes 19
Richardson on Coagulation .. 30
Shea's Animal Physiology 32

PSYCHOLOGY.

PAGE
Bateman on Aphasia 8
Browne's Medical Jurisprudence of Insanity 11
Bucknill and Tuke's Psychological Medicine 11
Davey on Nature of Insanity .. 14
Murray on Emotional Diseases 27
Sankey on Mental Diseases .. 31
Van der Kolk on Mental Disease 37
West Riding Asylum Reports .. 38
Winslow's Obscure Dis. of Brain 39

PULMONARY and CHEST DISEASES, &c.

Alison on Pulmonary Consumption 6
Bennet on Consumption 9
Bright on the Chest 11
Cotton on Stethoscope 14
Davies on Lungs and Heart .. 14
Dobell on the Chest 15
Do. on Tuberculosis 15
Do. on Winter Cough 15
Do. First Stage of Consumption 15
Fuller on the Lungs 16
Do. on Heart 16
Garrett on the Windpipe and Consumption 17
Jones (Jas.) on Consumption .. 23
Laennec on Auscultation 23
Markham on Heart 26
Myers on Diseases of Heart among Soldiers 27
Peacock on the Heart 28
Pirrie on Hay Asthma 29
Salter on Asthma 31
Skoda on Auscultation 33
Thompson on Consumption .. 35
Thorowgood on Asthma 35
Turnbull on Consumption .. 36
Waters on the Chest 37
Do. on Emphysema 37

RENAL and URINARY DISEASES.

Basham on Renal Diseases .. 8
Beale on Kidney Diseases .. 8
Do. on Urinary Deposits .. 8
Bird's Urinary Deposits 10
Harley on Urine 19
Parkes on Urine 29
Todd on Urinary Organs 36

SCIENCE.

Bentley's Manual of Botany .. 8
Brooke's Natural Philosophy .. 11
Hardwich's Photography 19
Hinds' Harmonies 20
Howard on the Clouds 21
Huxley on Classification of Animals 22
Do. Anatomy of Vertebrates .. 22
Jones (Bence) on Matter and Force 22
Jones (Wharton) on Vision .. 23
Do. on Body, Sense, and Mind 23
Mayne's Lexicon of Terms .. 26
Noad on the Inductorium .. 27
Ord's Comparative Anatomy .. 28

SCIENCE—*continued.*

PAGE
Pratt's Genealogy of Creation .. 29
Do. Eccentric & Centric Force 29
Do. on Orbital Motion 29
Do. Astronomical Investigations 29
Do. Oracles of God 29
Price's Photography 30
Reymond's Animal Electricity 30
Taylor's Medical Jurisprudence 35
Vestiges of Creation 36

SURGERY.

Adams on Reparation of Tendons 6
Do. Subcutaneous Surgery 6
Allen on Aural Catarrh 6
Allingham on Rectum 7
Anderson on the Skin 7
Ashton on Rectum 7
Brodhurst on Anchylosis 11
Bryant on Diseases of Joints .. 11
Do. Clinical Surgery .. 11
Callender on Rupture 12
Chapman on Ulcers 12
Do. Varicose Veins 12
Clark on Visceral Lesions .. 13
Do. Outlines of Surgery 13
Collis on Cancer 13
Cooper's Surgical Dictionary 14
Coulson on Stone in Bladder .. 14
Curling on Rectum 14
Do. on Testis 14
De Morgan on Cancer 15
Druitt's Surgeon's Vade-Mecum 15
Fayrer's Clinical Surgery .. 15
Fergusson's Surgery 16
Do. Progress of Surgery 16
Gamgee on Fractures 17
Gant's Principles of Surgery .. 17

SURGERY—*continued.*

PAGE
Gant's Practice of do. 17
Gay on Varicose Disease 17
Heath's Minor Surgery and Bandaging 20
Do. on the Jaws 20
Higginbottom on Nitrate of Silver 20
Hill on Stricture 20
Hodgson on Prostate 20
Holt on Stricture 21
Holthouse on Tumours of the Groin 21
Jordan on Inflammations .. 23
Lawrence's Surgery 23
Do. Ruptures 23
Lee's Practical Pathology .. 24
Liston's Surgery 24
Logan on Skin Diseases 24
Maccormac's Ambulance Surgeon 25
Macleod's Surgery of the Crimea 25
Maclise on Fractures 25
Marsden on Cancer 26
Maunder's Operative Surgery .. 26
Nayler on Skin Diseases 27
Pirrie's Surgery 29
Price on Excision of Knee-joint 29
Sansom on Chloroform .. . 32
Savage on the Female Pelvic Organs 32
Smith (Hy.) on Stricture 33
Do. on Hæmorrhoids 33
Do. on the Surgery of the Rectum 33
Do. (Dr. J.) Dental Anatomy and Surgery 33
Spender on Ulcers 34
Steggall's Surgical Manual .. 34
Swain on the Knee-Joint 34
Thompson on Stricture 35
Do. on Prostate 35

SURGERY—*continued.*

PAGE
Thompson on Lithotomy and Lithotrity 35
Thompson on Urinary Organs 35
Tomes' Dental Surgery 37
Wade on Stricture 36
Webb's Surgeon's Ready Rules 38
Wilson on Skin Diseases 39
Do. Portraits of Skin Diseases 39

VETERINARY MEDICINE.

Armatage's Emergencies .. 7
Blaine's Veterinary Art 10
Bourguignon on the Cattle Plague 10
Haycock on Shoeing Horses .. 19
Tuson's Pharmacopœia 36

WOMEN AND CHILDREN, Diseases of.

Bennet on Uterus 9
Dillnberger (ed. by Nicol) on Treatment of Women's and Children's Diseases 27
Ellis on Children 15
Harrison on Children 19
Hood on Scarlet Fever, &c. .. 21
Kiwisch (ed. by Clay) on Ovaries 13
Lee's Ovarian & Uterine Diseases 24
Do. on Speculum 24
Norton on Infantile Diseases .. 27
Tilt on Uterine Inflammation .. 36
Do. Uterine Therapeutics .. 36
Do. on Change of Life 36
Underwood on Children 36
West on Women 38
Wright on Uterine Disorders .. 39

WILLIAM ACTON, M.R.C.S.

I.

THE FUNCTIONS AND DISORDERS OF THE REPRODUCTIVE ORGANS IN CHILDHOOD, YOUTH, ADULT AGE, AND ADVANCED LIFE, considered in their Physiological, Social, and Moral Relations. Fifth Edition. 8vo., 12*s.*

II.

PROSTITUTION: Considered in its Moral, Social, and Sanitary Aspects, Second Edition, enlarged. 8vo., 12*s.*

ROBERT ADAMS, A.M., C.M., M.D.

A TREATISE ON RHEUMATIC GOUT; OR, CHRONIC RHEUMATIC ARTHRITIS. 8vo., with a Quarto Atlas of Plates, 21*s.*

WILLIAM ADAMS, F.R.C.S.

I.

ON THE PATHOLOGY AND TREATMENT OF LATERAL AND OTHER FORMS OF CURVATURE OF THE SPINE. With Plates. 8vo., 10*s.* 6*d.*

II.

CLUBFOOT: its Causes, Pathology, and Treatment. Jacksonian Prize Essay for 1864. With 100 Engravings. 8vo., 12*s.*

III.

ON THE REPARATIVE PROCESS IN HUMAN TENDONS AFTER SUBCUTANEOUS DIVISION FOR THE CURE OF DEFORMITIES. With Plates. 8vo., 6*s.*

IV.

SKETCH OF THE PRINCIPLES AND PRACTICE OF SUBCUTANEOUS SURGERY. 8vo., 2*s.* 6*d.*

WILLIAM ADDISON, F.R.C.P., F.R.S.

I.

CELL THERAPEUTICS. 8vo., 4*s.*

II.

ON HEALTHY AND DISEASED STRUCTURE, AND THE TRUE PRINCIPLES OF TREATMENT FOR THE CURE OF DISEASE, ESPECIALLY CONSUMPTION AND SCROFULA, founded on MICROSCOPICAL ANALYSIS. 8vo., 12*s.*

C. J. B. ALDIS, M.D., F.R.C.P.

AN INTRODUCTION TO HOSPITAL PRACTICE IN VARIOUS COMPLAINTS; with Remarks on their Pathology and Treatment. 8vo., 5*s.* 6*d.*

SOMERVILLE SCOTT ALISON, M.D.EDIN., F.R.C.P.

THE PHYSICAL EXAMINATION OF THE CHEST IN PULMONARY CONSUMPTION, AND ITS INTERCURRENT DISEASES. With Engravings. 8vo., 12*s.*

PETER ALLEN, M.D. F.R.C.S. EDIN.

AURAL CATARRH; or, the Commonest Forms of Deafness, and their Cure. With Engravings. Post 8vo., 6*s.* 6*d.*

WILLIAM ALLINGHAM, F.R.C.S.

FISTULA, HÆMORRHOIDS, PAINFUL ULCER, STRICTURE, PROLAPSUS AND OTHER DISEASES OF THE RECTUM: THEIR DIAGNOSIS AND TREATMENT. 8vo., 6*s.*

JULIUS ALTHAUS, M.D., M.R.C.P.

ON EPILEPSY, HYSTERIA, AND ATAXY. Cr. 8vo., 4*s.*

THE ANATOMICAL REMEMBRANCER; OR, COMPLETE POCKET ANATOMIST. Seventh Edition, carefully Revised. 32mo., 3*s.* 6*d.*

A. F. ANDERSON, M.D.,

FOURTEEN COLOURED PHOTOGRAPHS OF LEPROSY as met with in the Straits Settlements. With Explanatory Notes. 4to., £1. 11*s.* 6*d.*

MCCALL ANDERSON, M.D., F.F.P.S.

I.

THE PARASITIC AFFECTIONS OF THE SKIN. Second Edition. With Engravings. 8vo., 7*s.* 6*d.*

II.

ECZEMA. Second Edition. 8vo., 6*s.*

III.

PSORIASIS AND LEPRA. With Chromo-lithograph. 8vo., 5*s.*

GEORGE ARMATAGE, M.R.C.V.S.

THE VETERINARIAN'S POCKET REMEMBRANCER: containing concise directions for the Treatment of Urgent or Rare Cases, embracing Semeiology, Diagnosis, Prognosis, Surgery, Therapeutics, Detection of Poisons, Hygiene, &c. Post 18mo., 3*s.*

SIR ALEXANDER ARMSTRONG, C.B., M.D., F.R.C.P., R.N.

OBSERVATIONS ON NAVAL HYGIENE AND SCURVY. More particularly as the latter appeared during a Polar Voyage. 8vo., 5*s.*

T. J. ASHTON, M.R.C.S.

I.

ON THE DISEASES, INJURIES, AND MALFORMATIONS OF THE RECTUM AND ANUS. Fourth Edition. 8vo., 8*s.*

II.

PROLAPSUS, FISTULA IN ANO, AND OTHER DISEASES OF THE RECTUM; their Pathology and Treatment. Third Edition. Post 8vo., 3*s.* 6*d.*

A. W. BARCLAY, M.D., F.R.C.P.

I.

A MANUAL OF MEDICAL DIAGNOSIS. Third Edition. Foolscap 8vo., 10*s.* 6*d.*

II.

MEDICAL ERRORS.—Fallacies connected with the Application of the Inductive Method of Reasoning to the Science of Medicine. Post 8vo., 5*s.*

III.

GOUT AND RHEUMATISM IN RELATION TO DISEASE OF THE HEART. Post 8vo., 5*s.*

G. H. BARLOW, M.D., F.R.C.P.

A MANUAL OF THE PRACTICE OF MEDICINE. Second Edition. Fcap. 8vo., 12*s.* 6*d.*

ROBERT BARNES, M.D., F.R.C.P.

LECTURES ON OBSTETRIC OPERATIONS, INCLUDING THE TREATMENT OF HÆMORRHAGE, and forming a Guide to the Management of Difficult Labour. Second Edition, with 113 Engravings 8vo., 15*s.*

E. BASCOME, M.D.

A HISTORY OF EPIDEMIC PESTILENCES, FROM THE EARLIEST AGES. 8vo., 8*s.*

W. R. BASHAM, M.D., F.R.C.P.

I.

RENAL DISEASES; a CLINICAL GUIDE to their DIAGNOSIS and TREATMENT. 8vo., 7*s.*

II.

ON DROPSY, AND ITS CONNECTION WITH DISEASES OF THE KIDNEYS, HEART, LUNGS AND LIVER. With 16 Plates. Third Edition. 8vo., 12*s.* 6*d.*

FREDERIC BATEMAN, M.D., M.R.C.P.

APHASIA OR LOSS OF SPEECH, and the LOCALISATION of the FACULTY of ARTICULATE LANGUAGE. 8vo., 7*s.*

LIONEL S. BEALE, M.B., F.R.S., F.R.C.P.

I.

ON KIDNEY DISEASES, URINARY DEPOSITS, AND CALCULOUS DISORDERS. Third Edition, much Enlarged. With 70 Plates. 8vo., 25*s.*

II.

ONE HUNDRED URINARY DEPOSITS ON TWO SHEETS FOR THE HOSPITAL LABORATORY OR SURGERY. Each Sheet, 2*s.* 6*d.*; on Roller, 3*s.* 6*d.*

III.

THE MICROSCOPE, IN ITS APPLICATION TO PRACTICAL MEDICINE. Third Edition. With 58 Plates. 8vo., 16*s.*

IV.

PROTOPLASM; OR, LIFE, MATTER AND MIND. Second Edition. With 8 Plates. Crown 8vo., 6*s.* 6*d.*

V.

DISEASE GERMS; their SUPPOSED NATURE. An ORIGINAL INVESTIGATION. With Plates. Crown 8vo., 3*s.* 6*d.*

VI.

DISEASE GERMS; their Real Nature. With 24 Plates (16 Coloured). Crown 8vo., 8*s.* 6*d.*

VII.

LIFE THEORIES: THEIR INFLUENCE UPON RELIGIOUS THOUGHT. With 6 Coloured Plates. Crown 8vo., 5*s.* 6*d.*

HENRY BEASLEY.

I.

THE BOOK OF PRESCRIPTIONS; containing 3000 Prescriptions. Collected from the Practice of the most eminent Physicians and Surgeons, English and Foreign. Fourth Edition. 18mo., *6s.*

II.

THE DRUGGIST'S GENERAL RECEIPT-BOOK: comprising a copious Veterinary Formulary and Table of Veterinary Materia Medica; Patent and Proprietary Medicines, Druggists' Nostrums, &c.; Perfumery, Skin Cosmetics, Hair Cosmetics, and Teeth Cosmetics; Beverages, Dietetic Articles, and Condiments; Trade Chemicals, Miscellaneous Preparations and Compounds used in the Arts, &c.; with useful Memoranda and Tables. Sixth Edition. 18mo., *6s.*

III.

THE POCKET FORMULARY AND SYNOPSIS OF THE BRITISH AND FOREIGN PHARMACOPŒIAS; comprising standard and approved Formulæ for the Preparations and Compounds employed in Medical Practice. Ninth Edition, containing the Formulæ of the most recent Edition of the B. P. 18mo., *6s.*

HENRY BENNET, M.D.

I.

A PRACTICAL TREATISE ON UTERINE DISEASES. Fourth Edition, revised, with Additions. 8vo., *16s.*

II.

WINTER AND SPRING ON THE SHORES OF THE MEDITERRANEAN: OR, THE RIVIERA, MENTONE, ITALY, CORSICA, SICILY, ALGERIA, SPAIN, AND BIARRITZ, AS WINTER CLIMATES. Fourth Edition, with numerous Plates, Maps, and Wood Engravings. Post 8vo., *12s.*

III.

ON THE TREATMENT OF PULMONARY CONSUMPTION BY HYGIENE, CLIMATE, AND MEDICINE. Second Edition, enlarged. 8vo., *5s.*

J. RISDON BENNETT, M.D., F.R.C.P.

CANCEROUS AND OTHER INTRA-THORACIC GROWTHS, THEIR NATURAL HISTORY AND DIAGNOSIS. With Plates. Post 8vo., *8s.*

ROBERT BENTLEY, F.L.S.

A MANUAL OF BOTANY. With 1,127 Engravings on Wood. Second Edition. Fcap. 8vo., *12s. 6d.*

ALBERT J. BERNAYS, PH.D., F.C.S.

NOTES FOR STUDENTS IN CHEMISTRY; being a Syllabus compiled from the Manuals of Miller, Fownes, Berzelius, Gerhardt, Gorup-Besanez, &c., Fifth Edition. Fcap. 8vo., *3s. 6d.*

HENRY HEATHER BIGG.

ORTHOPRAXY: a complete Guide to the Modern Treatment of Deformities by Mechanical Appliances. With 300 Engravings. Second Edition. Post 8vo., *10s.*

S. B. BIRCH, M.D., M.R.C.P.

I.

OXYGEN: ITS ACTION, USE, AND VALUE IN THE TREATMENT OF VARIOUS DISEASES OTHERWISE INCURABLE OR VERY INTRACTABLE. Second Edition. Post 8vo., *3s. 6d.*

II.

CONSTIPATED BOWELS: the Various Causes and the Different Means of Cure. Third Edition. Post 8vo., *3s. 6d.*

GOLDING BIRD, M.D., F.R.S.

URINARY DEPOSITS; THEIR DIAGNOSIS, PATHOLOGY, AND THERAPEUTICAL INDICATIONS. With Engravings. Fifth Edition. Edited by E. Lloyd Birkett, M.D. Post 8vo., 10*s.* 6*d.*

* * *

JOHN BISHOP, F.R.C.S., F.R.S.

I.

ON DEFORMITIES OF THE HUMAN BODY, their Pathology and Treatment. With Engravings on Wood. 8vo., 10*s.*

II.

ON ARTICULATE SOUNDS, AND ON THE CAUSES AND CURE OF IMPEDIMENTS OF SPEECH. 8vo., 4*s.*

* * *

BLAINE.

OUTLINES OF THE VETERINARY ART; OR, A TREATISE ON THE ANATOMY, PHYSIOLOGY, AND DISEASES OF THE HORSE, NEAT CATTLE, AND SHEEP. Seventh Edition. By Charles Steel, M.R.C.V.S.L. With Plates. 8vo., 18*s.*

* * *

C. L. BLOXAM.

I.

CHEMISTRY, INORGANIC AND ORGANIC; with Experiments and a Comparison of Equivalent and Molecular Formulæ. With 276 Engravings on Wood. 8vo., 16*s.*

II.

LABORATORY TEACHING; OR PROGRESSIVE EXERCISES IN PRACTICAL CHEMISTRY. Second Edition. With 89 Engravings. Crown 8vo., 5*s.* 6*d.*

* * *

HONORÉ BOURGUIGNON, M.D.

ON THE CATTLE PLAGUE; OR, CONTAGIOUS TYPHUS IN HORNED CATTLE: its History, Origin, Description, and Treatment. Post 8vo., 5*s.*

* * *

JOHN E. BOWMAN, & C. L. BLOXAM.

I.

PRACTICAL CHEMISTRY, including Analysis. With numerous Illustrations on Wood. Sixth Edition. Foolscap 8vo., 6*s.* 6*d.*

II.

MEDICAL CHEMISTRY; with Illustrations on Wood. Fourth Edition, carefully revised. Fcap. 8vo., 6*s.* 6*d.*

* * *

P. MURRAY BRAIDWOOD, M.D. EDIN.

ON PYÆMIA, OR SUPPURATIVE FEVER: the Astley Cooper Prize Essay for 1868. With 12 Plates. 8vo., 10*s.* 6*d.*

* * *

JAMES BRIGHT, M.D.

ON DISEASES OF THE HEART, LUNGS, & AIR PASSAGES; with a Review of the several Climates recommended in these Affections. Third Edition. Post 8vo., 9*s.*

WILLIAM BRINTON, M.D., F.R.S.

I.

THE DISEASES OF THE STOMACH, with an Introduction on its Anatomy and Physiology; being Lectures delivered at St. Thomas's Hospital. Second Edition. 8vo., 10*s*. 6*d*.

II.

INTESTINAL OBSTRUCTION. Edited by DR. BUZZARD. Post 8vo., 5*s*.

BERNARD E. BRODHURST, F.R.C.S.

I.

ON DEFORMITIES OF THE HUMAN BODY: a System of Orthopædic Surgery. With Engravings. 8vo., 10*s*. 6*d*.

II.

CURVATURES OF THE SPINE: their Causes, Symptoms, Pathology, and Treatment. Second Edition. Roy. 8vo., with Engravings, 7*s*. 6*d*.

III.

ON THE NATURE AND TREATMENT OF CLUBFOOT AND ANALOGOUS DISTORTIONS involving the TIBIO-TARSAL ARTICULATION. With Engravings on Wood. 8vo., 4*s*. 6*d*.

IV.

PRACTICAL OBSERVATIONS ON THE DISEASES OF THE JOINTS INVOLVING ANCHYLOSIS, and on the TREATMENT for the RESTORATION of MOTION. Third Edition, much enlarged, 8vo., 4*s*. 6*d*.

CHARLES BROOKE, M.A., M.B., F.R.S.

ELEMENTS OF NATURAL PHILOSOPHY. Based on the Work of the late Dr. Golding Bird. Sixth Edition. With 700 Engravings. Fcap. 8vo., 12*s*. 6*d*.

J. CAMPBELL BROWN, D.SC., F.C.S.

ANALYTICAL TABLES FOR STUDENTS OF PRACTICAL CHEMISTRY. 8vo., 2*s*. 6*d*.

J. H. BALFOUR BROWNE, BARRISTER-AT-LAW.

THE MEDICAL JURISPRUDENCE OF INSANITY. 8vo. 10*s*. 6*d*.

T. L. BRUNTON, B.SC., M.B.

ON DIGITALIS. With some Observations on the Urine. Fcap. 8vo., 4*s*. 6*d*.

THOMAS BRYANT, F.R.C.S.

I.

ON THE DISEASES AND INJURIES OF THE JOINTS. CLINICAL AND PATHOLOGICAL OBSERVATIONS. Post 8vo., 7*s*. 6*d*.

II.

CLINICAL SURGERY. Parts I. to VII. 8vo., 3*s*. 6*d*. each.

FLEETWOOD BUCKLE, M.D., L.R.C.P.LOND.

VITAL AND ECONOMICAL STATISTICS OF THE HOSPITALS, INFIRMARIES, &c., OF ENGLAND AND WALES. Royal 8vo., 5*s*.

JOHN CHARLES BUCKNILL, M.D., F.R.C.P., F.R.S., & DANIEL H. TUKE, M.D

A MANUAL OF PSYCHOLOGICAL MEDICINE: containing the History, Nosology, Description, Statistics, Diagnosis, Pathology, and Treatment of Insanity. Second Edition. 8vo., 15*s*.

GEORGE BUDD, M.D., F.R.C.P., F.R.S.

I.

ON DISEASES OF THE LIVER. Illustrated with Coloured Plates and Engravings on Wood. Third Edition. 8vo., 16*s*.

II.

ON THE ORGANIC DISEASES AND FUNCTIONAL DISORDERS OF THE STOMACH. 8vo., 9*s*.

G. W. CALLENDER, F.R.C.S.

FEMORAL RUPTURE: Anatomy of the Parts concerned. With Plates. 8vo., 4*s*.

JOHN M. CAMPLIN, M.D., F.L.S.

ON DIABETES, AND ITS SUCCESSFUL TREATMENT. Third Edition, by Dr. Glover. Fcap. 8vo., 3*s*. 6*d*.

W. B. CARPENTER, M.D., F.R.S.

I.

PRINCIPLES OF HUMAN PHYSIOLOGY. With nearly 300 Illustrations on Steel and Wood. Seventh Edition. Edited by Mr. HENRY POWER. 8vo., 28*s*.

II.

A MANUAL OF PHYSIOLOGY. With 252 Illustrations on Steel and Wood. Fourth Edition. Fcap. 8vo., 12*s*. 6*d*.

III.

THE MICROSCOPE AND ITS REVELATIONS. With more than 400 Engravings on Steel and Wood. Fourth Edition. Fcap. 8vo., 12*s*. 6*d*.

T. K. CHAMBERS, M.D., F.R.C.P.

I.

LECTURES, CHIEFLY CLINICAL. Fourth Edition. 8vo., 14*s*.

II.

THE INDIGESTIONS OR DISEASES OF THE DIGESTIVE ORGANS FUNCTIONALLY TREATED. Second Edition. 8vo., 10*s*. 6*d*.

III.

SOME OF THE EFFECTS OF THE CLIMATE OF ITALY. Crown 8vo., 4*s*. 6*d*.

H. T. CHAPMAN, F.R.C.S.

I.

THE TREATMENT OF OBSTINATE ULCERS AND CUTANEOUS ERUPTIONS OF THE LEG WITHOUT CONFINEMENT. Third Edition. Post 8vo., 3*s*. 6*d*.

II.

VARICOSE VEINS: their Nature, Consequences, and Treatment, Palliative and Curative. Second Edition. Post 8vo., 3*s*. 6*d*.

JOHN CHAPMAN, M.D., M.R.C.P.

THE MEDICAL INSTITUTIONS OF THE UNITED KINGDOM; a History exemplifying the Evils of Over-Legislation. 8vo., 3*s*. 6*d*.

PYE HENRY CHAVASSE, F.R.C.S.

I.

ADVICE TO A MOTHER ON THE MANAGEMENT OF HER CHILDREN. Tenth Edition. Foolscap 8vo., 2*s.* 6*d.*

II.

COUNSEL TO A MOTHER: being a Continuation and the Completion of "Advice to a Mother." Second Edition. Fcap. 8vo., 2*s.* 6*d.*

III.

ADVICE TO A WIFE ON THE MANAGEMENT OF HER OWN HEALTH. With an Introductory Chapter, especially addressed to a Young Wife. Ninth Edition. Fcap. 8vo., 2*s.* 6*d.*

F. LE GROS CLARK, F.R.C.S.

I.

LECTURES ON THE PRINCIPLES OF SURGICAL DIAGNOSIS: ESPECIALLY IN RELATION TO SHOCK AND VISCERAL LESIONS Delivered at the Royal College of Surgeons. 8vo., 10*s.* 6*d.*

II.

OUTLINES OF SURGERY; being an Epitome of the Lectures on the Principles and the Practice of Surgery delivered at St. Thomas's Hospital. Fcap. 8vo., 5*s.*

JOHN CLAY, M.R.C.S.

KIWISCH ON DISEASES OF THE OVARIES: Translated, by permission, from the last German Edition of his Clinical Lectures on the Special Pathology and Treatment of the Diseases of Women. With Notes, and an Appendix on the Operation of Ovariotomy. Royal 12mo., 16*s.*

T. SPENCER COBBOLD, M.D., F.R.S.

WORMS: a Series of Lectures delivered at the Middlesex Hospital on Practical Helminthology. Post 8vo., 5*s.*

OAKLEY COLES.

DEFORMITIES OF THE MOUTH; CONGENITAL and ACQUIRED; their Mechanical Treatment. With Coloured Plates. Second Edition, 8vo., 5*s.* 6*d.*

MAURICE H. COLLIS, M.D.DUB., F.R.C.S.I.

THE DIAGNOSIS AND TREATMENT OF CANCER AND THE TUMOURS ANALOGOUS TO IT. With coloured Plates. 8vo., 14*s.*

A. J. COOLEY.

THE CYCLOPÆDIA OF PRACTICAL RECEIPTS, PROCESSES, AND COLLATERAL INFORMATION IN THE ARTS, MANUFACTURES, PROFESSIONS, AND TRADES, INCLUDING MEDICINE, PHARMACY, AND DOMESTIC ECONOMY; designed as a General Book of Reference for the Manufacturer, Tradesman, Amateur, and Heads of Families. Fourth and greatly enlarged Edition, 8vo., 28*s.*

W. WHITE COOPER, F.R.C.S.

I.

ON WOUNDS AND INJURIES OF THE EYE. Illustrated by 17 Coloured Figures and 41 Woodcuts. 8vo., 12*s.*

II.

ON NEAR SIGHT, AGED SIGHT, IMPAIRED VISION, AND THE MEANS OF ASSISTING SIGHT. With 31 Illustrations on Wood. Second Edition. Fcap. 8vo., 7*s.* 6*d.*

S. COOPER.

A DICTIONARY OF PRACTICAL SURGERY AND ENCYCLOPÆDIA OF SURGICAL SCIENCE. New Edition, brought down to the present time. By SAMUEL A. LANE, F.R.C.S., assisted by various eminent Surgeons. Vol. I 8vo., £1. 5*s*.

R. P. COTTON, M.D., F.R.C.P.

PHTHISIS AND THE STETHOSCOPE; OR, THE PHYSICAL SIGNS OF CONSUMPTION. Fourth Edition. Foolscap 8vo., 3*s*. 6*d*.

WALTER J. COULSON, F.R.C.S.

I.

A TREATISE ON SYPHILIS. 8vo., 10*s*.

II.

STONE IN THE BLADDER: Its Prevention, Early Symptoms, and Treatment by Lithotrity. 8vo., 6*s*.

T. B. CURLING, F.R.C.S., F.R.S.

I.

OBSERVATIONS ON DISEASES OF THE RECTUM. Third Edition. 8vo., 7*s*. 6*d*.

II.

A PRACTICAL TREATISE ON DISEASES OF THE TESTIS, SPERMATIC CORD, AND SCROTUM. Third Edition, with Engravings. 8vo., 16*s*.

THOMAS CUTLER, M.D.

NOTES ON SPA; OR OBSERVATIONS ON ITS CHALYBEATE SPRINGS. Ninth Edition. Crown 8vo., 2*s*.

WILLIAM DALE, M.D.LOND.

A COMPENDIUM OF PRACTICAL MEDICINE AND MORBID ANATOMY. With Plates, 12mo., 7*s*.

DONALD DALRYMPLE, M.P., M.R.C.P.

THE CLIMATE OF EGYPT: METEOROLOGICAL AND MEDICAL OBSERVATIONS, with Practical Hints for Invalid Travellers. Post 8vo., 4*s*.

JOHN DALRYMPLE, F.R.C.S., F.R.S.

PATHOLOGY OF THE HUMAN EYE. Complete in Nine Fasciculi: imperial 4to., 20*s*. each; half-bound morocco, gilt tops, 9*l*. 15*s*.

FRED. DAVIES, M.D., F.R.C.S.

THE UNITY OF MEDICINE: its CORRUPTIONS and DIVISIONS by LAW ESTABLISHED; their Causes, Effects and Remedy. With a Coloured Chart. Second Edition. 8vo., 10*s*.

HERBERT DAVIES, M.D., F.R.C.P.

ON THE PHYSICAL DIAGNOSIS OF DISEASES OF THE LUNGS AND HEART. Second Edition. Post 8vo., 8*s*.

JAMES G. DAVEY, M.D., M.R.C.P.

I.

THE GANGLIONIC NERVOUS SYSTEM: its Structure, Functions, and Diseases. 8vo., 9*s*.

II.

ON THE NATURE AND PROXIMATE CAUSE OF INSANITY. Post 8vo., 3*s*.

HENRY DAY, M.D., M.R.C.P.

CLINICAL HISTORIES; with Comments. 8vo., 7*s*. 6*d*.

CAMPBELL DE MORGAN, F.R.S., F.R.C.S.,

THE ORIGIN OF CANCER considered with Reference to the Treatment of the Disease. Crown 8vo., 3*s*. 6*d*.

JAMES DIXON, F.R.C.S.

A GUIDE TO THE PRACTICAL STUDY OF DISEASES OF THE EYE. Third Edition. Post 8vo., 9*s*.

HORACE DOBELL, M.D.

I.

DEMONSTRATIONS OF DISEASES IN THE CHEST, AND THEIR PHYSICAL DIAGNOSIS. With Coloured Plates. 8vo., 12*s*. 6*d*.

II.

LECTURES ON THE GERMS AND VESTIGES OF DISEASE, and on the Prevention of the Invasion and Fatality of Disease by Periodical Examinations. 8vo., 6*s*. 6*d*.

III.

ON TUBERCULOSIS: ITS NATURE, CAUSE, AND TREATMENT; with Notes on Pancreatic Juice. Second Edition. Crown 8vo., 3*s*. 6*d*.

IV.

LECTURES ON WINTER COUGH (CATARRH, BRONCHITIS, EMPHYSEMA, ASTHMA); with an Appendix on some Principles of Diet in Disease. Second Edition, with Coloured Plates. 8vo., 8*s*. 6*d*.

V.

LECTURES ON THE TRUE FIRST STAGE OF CONSUMPTION. Crown 8vo., 3*s*. 6*d*.

C. TOOGOOD DOWNING, M.D.

NEURALGIA: its various Forms, Pathology, and Treatment. The Jacksonian Prize Essay for 1850. 8vo., 10*s*. 6*d*.

ROBERT DRUITT, F.R.C.S.

THE SURGEON'S VADE-MECUM; with numerous Engravings on Wood. Tenth Edition. Foolscap 8vo., 12*s*. 6*d*.

CHARLES ELAM, M.D., F.R.C.P.

MEDICINE, DISEASE, AND DEATH: being an Enquiry into the Progress of Medicine as a Practical Art. 8vo., 3*s*. 6*d*.

EDWARD ELLIS, M.D.

A PRACTICAL MANUAL OF THE DISEASES OF CHILDREN. With a Formulary. Crown 8vo., 6*s*.

SIR JAMES EYRE, M.D.

THE STOMACH AND ITS DIFFICULTIES. Sixth Edition, by Mr. Beale. Fcap. 8vo., 2*s*. 6*d*.

J. FAYRER, M.D., F.R.C.S., C.S.I.

CLINICAL SURGERY IN INDIA. With Engravings. 8vo., 16*s*.

SAMUEL FENWICK, M.D., F.R.C.P.

I.

THE MORBID STATES OF THE STOMACH AND DUODENUM, AND THEIR RELATIONS TO THE DISEASES OF OTHER ORGANS. With 10 Plates. 8vo., 12*s.*

II.

THE STUDENT'S GUIDE TO MEDICAL DIAGNOSIS. Second Edition. With 60 Engravings. Fcap. 8vo., 6*s.* 6*d.*

SIR WILLIAM FERGUSSON, BART., F.R.C.S., F.R.S.

I.

A SYSTEM OF PRACTICAL SURGERY; with 463 Illustrations on Wood. Fifth Edition. 8vo., 21*s.*

II.

LECTURES ON THE PROGRESS OF ANATOMY AND SURGERY DURING THE PRESENT CENTURY. With numerous Engravings. 8vo., 10*s.* 6*d.*

W. H. FLOWER, F.R.C.S., F.R.S.

DIAGRAMS OF THE NERVES OF THE HUMAN BODY, exhibiting their Origin, Divisions, and Connexions, with their Distribution to the various Regions of the Cutaneous Surface, and to all the Muscles. Folio, containing Six Plates, 14*s.*

BALTHAZAR W. FOSTER, M.D.

METHOD AND MEDICINE: an Essay on the Past, Present, and Future of Medicine. 8vo., 2*s.* 6*d.*

G. FOWNES, PH.D., F.R.S.

I.

A MANUAL OF CHEMISTRY; with 187 Illustrations on Wood. Tenth Edition. Fcap. 8vo., 14*s.*
Edited by H. Bence Jones, M.D., F.R.S., and Henry Watts, B.A., F.R.S.

II.

CHEMISTRY, AS EXEMPLIFYING THE WISDOM AND BENEFICENCE OF GOD. Second Edition. Fcap. 8vo., 4*s.* 6*d.*

III.

INTRODUCTION TO QUALITATIVE ANALYSIS. Post 8vo., 2*s.*

D. J. T. FRANCIS, M.D., F.R.C.P.

CHANGE OF CLIMATE; considered as a Remedy in Dyspeptic, Pulmonary, and other Chronic Affections; with an Account of the most Eligible Places of Residence for Invalids, at different Seasons of the Year. Post 8vo., 8*s.* 6*d.*

W. H. FULLER, M.D., F.R.C.P.

I.

ON DISEASES OF THE LUNGS AND AIR PASSAGES. Second Edition. 8vo., 12*s.* 6*d.*

II.

ON DISEASES OF THE HEART AND GREAT VESSELS. 8vo., 7*s.* 6*d.*

III.

ON RHEUMATISM, RHEUMATIC GOUT, AND SCIATICA: their Pathology, Symptoms, and Treatment. Third Edition. 8vo., 12*s.* 6*d.*

REMIGIUS FRESENIUS.

A SYSTEM OF INSTRUCTION IN CHEMICAL ANALYSIS. Edited by ARTHUR VACHER.

QUALITATIVE. Seventh Edition. 8vo., 9*s.*
QUANTITATIVE. Fifth Edition. 8vo., 12*s.* 6*d.*

ROBERT GALLOWAY.

I.

THE FIRST STEP IN CHEMISTRY. With numerous Engravings. Fourth Edition. Fcap. 8vo., 6*s.* 6*d.*

A KEY TO THE EXERCISES. 2*s.* 6*d.*

II.

THE SECOND STEP IN CHEMISTRY; or, the Student's Guide to the Higher Branches of the Science. With Engravings. 8vo., 10*s.*

III.

A MANUAL OF QUALITATIVE ANALYSIS. Fifth Edition. With Engravings. Post 8vo., 8*s.* 6*d.*

IV.

CHEMICAL TABLES. On Five Large Sheets, for School and Lecture Rooms. Second Edition. 4*s.* 6*d.*

J. SAMPSON GAMGEE, M.R.C.S.

ON THE TREATMENT OF FRACTURES OF THE LIMBS. With Plates. 8vo., 10*s.* 6*d.*

F. J. GANT, F.R.C.S.

I.

THE PRINCIPLES OF SURGERY: Clinical, Medical, and Operative. With Engravings. 8vo., 18*s.*

II.

THE SCIENCE AND PRACTICE OF SURGERY: a complete System and Textbook. With 470 Engravings. 8vo, £1. 4*s.*

III.

THE IRRITABLE BLADDER: its Causes and Treatment. Third Edition, with Engravings. Crown 8vo., 6*s.*

C. B. GARRETT, M.D.

IRRITATIVE DYSPEPSIA AND ITS IMPORTANT CONNECTION with IRRITATIVE CONGESTION of the WINDPIPE, and with the Origin and Progress of Consumption. Crown 8vo., 2*s.* 6*d.*

GEORGE GASKOIN, SURGEON.

THE MEDICAL WORKS OF FRANCISCO LOPEZ DE VILLALOBOS, the celebrated Court Physician of Spain; containing the Poem on the Pestiferous Bubas; Dialogues on Medicine (15th and 16th centuries); &c. With Biography and Commentary. Post 8vo., 10*s.* 6*d.*

JOHN GAY, F.R.C.S.

ON VARICOSE DISEASE OF THE LOWER EXTREMITIES. LETTSOMIAN LECTURES. With Plates. 8vo., 5*s.*

SIR DUNCAN GIBB, BART., M.D.

THE LARYNGOSCOPE IN DISEASES OF THE THROAT, with a Chapter on RHINOSCOPY. Third Edition, with Engravings. Crown 8vo., 5*s.*

ROBERT G. GLENN, LL.B., BARRISTER-AT-LAW.

A MANUAL OF THE LAWS AFFECTING MEDICAL MEN. With a Chapter on Medical Etiquette by DR. A. CARPENTER. 8vo, 14*s*.

BENJAMIN GODFREY, M.D., F.R.A.S.

DISEASES OF HAIR: a popular Treatise upon the Affections of the Hair System. Fcap. 8vo., 3*s*. 6*d*.

C. A. GORDON M.D., C.B.

I.

ARMY HYGIENE. 8vo., 20*s*.

II.

CHINA, FROM A MEDICAL POINT OF VIEW; IN 1860 AND 1861; With a Chapter on Nagasaki as a Sanatarium. 8vo., 10*s*. 6*d*.

MICHAEL C. GRABHAM, M.D., M.R.C.P.

THE CLIMATE AND RESOURCES OF MADEIRA, as regarding chiefly the Necessities of Consumption and the Welfare of Invalids. With Map and Engravings. Crown 8vo., 5*s*.

R. J. GRAVES, M.D., F.R.S.

STUDIES IN PHYSIOLOGY AND MEDICINE. Edited by Dr. Stokes. With Portrait and Memoir. 8vo., 14*s*.

T. GRIFFITHS.

CHEMISTRY OF THE FOUR SEASONS—Spring, Summer, Autumn, Winter. Illustrated with Engravings on Wood. Second Edition. Foolscap 8vo., 7*s*. 6*d*.

W. A. GUY, M.B., F.R.S., AND JOHN HARLEY, M.D., F.R.C.P.

HOOPER'S PHYSICIAN'S VADE-MECUM: OR, MANUAL OF THE PRINCIPLES AND PRACTICE OF PHYSIC. Seventh Edition. With Engravings. Foolscap 8vo., 12*s*. 6*d*.

GUY'S HOSPITAL REPORTS. Third Series. Vol. XVII., 8vo. 7*s*. 6*d*.

S. O. HABERSHON, M.D., F.R.C.P.

I.

ON DISEASES OF THE ABDOMEN, comprising those of the Stomach and other Parts of the Alimentary Canal, Œsophagus, Stomach, Cæcum, Intestines, and Peritoneum. Second Edition, with Plates. 8vo., 14*s*.

II.

ON THE INJURIOUS EFFECTS OF MERCURY IN THE TREATMENT OF DISEASE. Post 8vo., 3*s*. 6*d*.

C. RADCLYFFE HALL, F.R.C.P.

TORQUAY IN ITS MEDICAL ASPECT AS A RESORT FOR PULMONARY INVALIDS. Post 8vo., 5*s*.

MARSHALL HALL, M.D., F.R.S.

I.

PRONE AND POSTURAL RESPIRATION IN DROWNING AND OTHER FORMS OF APNŒA OR SUSPENDED RESPIRATION. Post 8vo., 5*s*.

II.

PRACTICAL OBSERVATIONS AND SUGGESTIONS IN MEDICINE. Second Series. Post 8vo., 8*s*. 6*d*.

REV. T F. HARDWICH.

A MANUAL OF PHOTOGRAPHIC CHEMISTRY. With Engravings. Seventh Edition. Foolscap 8vo., 7*s*. 6*d*.

GEORGE HARLEY, M.D., F.R.S., F.R.C.P.

LECTURES ON THE URINE AND ITS DERANGEMENTS, with the Application of Physiological Chemistry to the Diagnosis and Treatment of Constitutional as well as Local Diseases. Post 8vo., 9*s*.

J. BOWER HARRISON, M.D., M.R.C.P.

I.

LETTERS TO A YOUNG PRACTITIONER ON THE DISEASES OF CHILDREN. Foolscap 8vo., 3*s*.

II.

ON THE CONTAMINATION OF WATER BY THE POISON OF LEAD, and its Effects on the Human Body. Foolscap 8vo., 3*s*. 6*d*.

GEORGE HARTWIG, M.D.

I.

ON SEA BATHING AND SEA AIR. Second Edition. Fcap. 8vo., 2*s*. 6*d*.

II.

ON THE PHYSICAL EDUCATION OF CHILDREN. Fcap. 8vo., 2*s*. 6*d*.

ALFRED HAVILAND, M.R.C.S.

CLIMATE, WEATHER, AND DISEASE; being a Sketch of the Opinions of the most celebrated Ancient and Modern Writers with regard to the Influence of Climate and Weather in producing Disease. With Four coloured Engravings. 8vo., 7*s*.

W. HAYCOCK, M.R.C.V.S.

HORSES; HOW THEY OUGHT TO BE SHOD: being a plain and practical Treatise on the Principles and Practice of the Farrier's Art. With 14 Plates. 7*s*. 6*d*.

F. W. HEADLAND, M.D., F.R.C.P.

I.

ON THE ACTION OF MEDICINES IN THE SYSTEM. Fourth Edition. 8vo., 14*s*.

II.

A MEDICAL HANDBOOK; comprehending such Information on Medical and Sanitary Subjects as is desirable in Educated Persons. Second Thousand. Foolscap 8vo., 5*s*.

J. N. HEALE, M.D., M.R.C.P.

I.

A TREATISE ON THE PHYSIOLOGICAL ANATOMY OF THE LUNGS. With Engravings. 8vo., 8*s*.

II.

A TREATISE ON VITAL CAUSES. 8vo., 9*s*.

CHRISTOPHER HEATH, F.R.C.S.

I.

PRACTICAL ANATOMY: a Manual of Dissections. With numerous Engravings. Second Edition. Fcap. 8vo., 12*s.* 6*d.*

II.

A MANUAL OF MINOR SURGERY AND BANDAGING, FOR THE USE OF HOUSE-SURGEONS, DRESSERS, AND JUNIOR PRACTITIONERS. With 74 Engravings. Fourth Edition. Fcap. 8vo., 5*s.* 6*d*

III.

INJURIES AND DISEASES OF THE JAWS. JACKSONIAN PRIZE ESSAY. With Engravings. 8vo., 12*s.*

JOHN HIGGINBOTTOM, F.R.S., F.R.C.S.E.

A PRACTICAL ESSAY ON THE USE OF THE NITRATE OF SILVER IN THE TREATMENT OF INFLAMMATION, WOUNDS, AND ULCERS. Third Edition, 8vo., 6*s.*

JOHN D. HILL, F.R.C.S.

AN ANALYSIS OF 140 CASES OF ORGANIC STRICTURE OF THE URETHRA, of which 120 were submitted to HOLT'S OPERATION, and 20 to PERINEAL SECTION. 8vo., 3*s.*

WILLIAM HINDS, M.D.

THE HARMONIES OF PHYSICAL SCIENCE IN RELATION TO THE HIGHER SENTIMENTS; with Observations on Medical Studies, and on the Moral and Scientific Relations of Medical Life. Post 8vo., 4*s.*

RICHARD HODGES, M.D.

THE NATURE, PATHOLOGY, AND TREATMENT OF PUERPERAL CONVULSIONS. Crown 8vo., 3s.

DECIMUS HODGSON, M.D.

THE PROSTATE GLAND, AND ITS ENLARGEMENT IN OLD AGE. With 12 Plates. Royal 8vo., 6*s.*

LUTHER HOLDEN, F.R.C.S.

I.

HUMAN OSTEOLOGY: with Plates, showing the Attachments of the Muscles. Fourth Edition. 8vo., 16*s.*

II.

A MANUAL OF THE DISSECTION OF THE HUMAN BODY. With Engravings on Wood. Third Edition. 8vo., 16*s.*

BARNARD HOLT, F.R.C.S.

ON THE IMMEDIATE TREATMENT OF STRICTURE OF THE URETHRA. Third Edition, Enlarged. 8vo., 6*s.*

C. HOLTHOUSE, F.R.C.S.

ON HERNIAL AND OTHER TUMOURS OF THE GROIN and its NEIGHBOURHOOD; with some Practical Remarks on the Radical Cure of Ruptures. 8vo., 6*s*. 6*d*.

P. HOOD, M.D.

I.

A TREATISE ON GOUT, RHEUMATISM, AND THE ALLIED AFFECTIONS. Crown 8vo., 10*s*. 6*d*.

II.

THE SUCCESSFUL TREATMENT OF SCARLET FEVER; also, OBSERVATIONS ON THE PATHOLOGY AND TREATMENT OF CROWING INSPIRATIONS OF INFANTS. Post 8vo., 5*s*.

JOHN HORSLEY.

A CATECHISM OF CHEMICAL PHILOSOPHY; being a Familiar Exposition of the Principles of Chemistry and Physics. With Engravings on Wood. Designed for the Use of Schools and Private Teachers. Post 8vo., 6*s*. 6*d*.

JAMES A. HORTON, M.D.

PHYSICAL AND MEDICAL CLIMATE AND METEOROLOGY OF THE WEST COAST OF AFRICA. 8vo., 10*s*.

LUKE HOWARD, F.R.S.

ESSAY ON THE MODIFICATIONS OF CLOUDS. Third Edition, by W. D. and E. HOWARD. With 6 Lithographic Plates, from Pictures by Kenyon. 4to., 10*s*. 6*d*.

A. HAMILTON HOWE, M.D.

A THEORETICAL INQUIRY INTO THE PHYSICAL CAUSE OF EPIDEMIC DISEASES. Accompanied with Tables. 8vo. 7*s*.

C. W. HUFELAND.

THE ART OF PROLONGING LIFE. Second Edition. Edited by ERASMUS WILSON, F.R.S. Foolscap 8vo., 2*s*. 6*d*.

W. CURTIS HUGMAN, F.R.C.S.

ON HIP-JOINT DISEASE; with reference especially to Treatment by Mechanical Means for the Relief of Contraction and Deformity of the Affected Limb. With Plates. Re-issue, enlarged. 8vo., 3*s*. 6*d*.

G. Y. HUNTER, M.R.C.S.

BODY AND MIND: the Nervous System and its Derangements. Fcap. 8vo., 3*s*. 6*d*.

JONATHAN HUTCHINSON, F.R.C.S.

A CLINICAL MEMOIR ON CERTAIN DISEASES OF THE EYE AND EAR, CONSEQUENT ON INHERITED SYPHILIS;

with an appended Chapter of Commentaries on the Transmission of Syphilis from Parent to Offspring, and its more remote Consequences. With Plates and Woodcuts, 8vo., 9*s*.

T. H. HUXLEY, LL.D., F.R.S.

I.

MANUAL OF THE ANATOMY OF VERTEBRATED ANIMALS.

With 110 Engravings. Fcap. 8vo., 12*s*.

II.

INTRODUCTION TO THE CLASSIFICATION OF ANIMALS.

With Engravings. 8vo., 6*s*.

THOMAS INMAN, M.D., M.R.C.P.

FOUNDATION FOR A NEW THEORY AND PRACTICE OF MEDICINE.

Second Edition. Crown 8vo., 10*s*.

JAMES JAGO, M.D.OXON., A.B.CANTAB.

ENTOPTICS, WITH ITS USES IN PHYSIOLOGY AND MEDICINE.

With 54 Engravings. Crown 8vo., 5*s*.

M. PROSSER JAMES, M.D., M.R.C.P.

SORE-THROAT: ITS NATURE, VARIETIES, AND TREATMENT;

including the Use of the LARYNGOSCOPE as an Aid to Diagnosis. Second Edition, with numerous Engravings. Post 8vo., 5*s*.

C. HANDFIELD JONES, M.B., F.R.C.P., F.R.S.

STUDIES ON FUNCTIONAL NERVOUS DISORDERS.

Second Edition, much enlarged. 8vo., 18*s*.

H. BENCE JONES, M.D., F.R.C.P., D.C.L., F.R.S.

I.

LECTURES ON SOME OF THE APPLICATIONS OF CHEMISTRY AND MECHANICS TO PATHOLOGY AND THERAPEUTICS.

8vo., 12*s*.

II.

CROONIAN LECTURES ON MATTER AND FORCE.

Fcap. 8vo., 5*s*.

C. HANDFIELD JONES, M.B., F.R.S., & E. H. SIEVEKING, M.D., F.R.C.P.

A MANUAL OF PATHOLOGICAL ANATOMY.

Illustrated with numerous Engravings on Wood. Foolscap 8vo., 12*s*. 6*d*.

JAMES JONES, M.D., M.R.C.P.

ON THE USE OF PERCHLORIDE OF IRON AND OTHER CHALYBEATE SALTS IN THE TREATMENT OF CONSUMPTION. Crown 8vo., 3*s*. 6*d*.

T. WHARTON JONES, F.R.C.S., F.R.S.

I.

A MANUAL OF THE PRINCIPLES AND PRACTICE OF OPHTHALMIC MEDICINE AND SURGERY; with Nine Coloured Plates and 173 Wood Engravings. Third Edition, thoroughly revised. Foolscap 8vo., 12*s*. 6*d*.

II.

THE WISDOM AND BENEFICENCE OF THE ALMIGHTY, AS DISPLAYED IN THE SENSE OF VISION. Actonian Prize Essay. With Illustrations on Steel and Wood. Foolscap 8vo., 4*s*. 6*d*.

III.

DEFECTS OF SIGHT AND HEARING: their Nature, Causes, Prevention, and General Management. Second Edition, with Engravings. Fcap. 8vo., 2*s*. 6*d*.

IV.

A CATECHISM OF THE MEDICINE AND SURGERY OF THE EYE AND EAR. For the Clinical Use of Hospital Students. Fcap. 8vo., 2*s*. 6*d*.

V.

A CATECHISM OF THE PHYSIOLOGY AND PHILOSOPHY OF BODY, SENSE, AND MIND. For Use in Schools and Colleges. Fcap. 8vo., 2*s*. 6*d*.

FURNEAUX JORDAN, F.R.C.S.

THE TREATMENT OF SURGICAL INFLAMMATIONS BY A NEW METHOD, WHICH GREATLY SHORTENS THEIR DURATION. With Plates. 8vo., 7*s*. 6*d*.

U. J. KAY-SHUTTLEWORTH, M.P.

FIRST PRINCIPLES OF MODERN CHEMISTRY: a Manual of Inorganic Chemistry. Second Edition. Crown 8vo., 4*s*. 6*d*.

GEORGE KENNION, M.D., F.R.C.P.

OBSERVATIONS ON THE MINERAL SPRINGS OF HARROGATE. Revised and Enlarged by ADAM BEALEY, M.A., M.D., F.R.C.P. Ninth Edition. Crown 8vo, 1*s*.

DR. LAENNEC.

A MANUAL OF AUSCULTATION AND PERCUSSION. Translated and Edited by J. B. SHARPE, M.R.C.S. Fcap. 8vo., 3*s*.

SIR WM. LAWRENCE, BART., F.R.S

I.

LECTURES ON SURGERY. 8vo., 16*s*.

II.

A TREATISE ON RUPTURES. The Fifth Edition, considerably enlarged. 8vo., 16*s*.

ARTHUR LEARED, M.D., F.R.C.P.

IMPERFECT DIGESTION: ITS CAUSES AND TREATMENT. Fifth Edition. Foolscap 8vo., 4*s.* 6*d.*

HENRY LEE, F.R.C.S.

PRACTICAL PATHOLOGY. Third Edition, in 2 Vols. Containing Lectures on Suppurative Fever, Diseases of the Veins, Hæmorrhoidal Tumours, Diseases of the Rectum, Syphilis, Gonorrhœal Ophthalmia, &c. 8vo., 10*s.* each vol.

ROBERT LEE, M.D, F.R.C.P., F.R.S.

I.

CONSULTATIONS IN MIDWIFERY. Foolscap 8vo., 4*s.* 6*d.*

II.

A TREATISE ON THE SPECULUM; with Three Hundred Cases. 8vo., 4*s.* 6*d.*

III.

CLINICAL REPORTS OF OVARIAN AND UTERINE DISEASES, with Commentaries. Foolscap 8vo., 6*s.* 6*d.*

WM. LEISHMAN, M.D., F.F.P.S.

THE MECHANISM OF PARTURITION: An Essay, Historical and Critical. With Engravings. 8vo., 5*s.*

F. HARWOOD LESCHER.

THE ELEMENTS OF PHARMACY. 8vo., 7*s.* 6*d.*

DR. LIEBREICH.

ATLAS OF OPHTHALMOSCOPY: representing the Normal and Pathological Conditions of the Fundus Oculi as seen with the Ophthalmoscope. Composed of 12 Chromo-lithographic Plates (containing 59 Figures), accompanied by an Explanatory Text, translated into English by H. ROSBOROUGH SWANZY, M.B. Dub. Second Edition, Enlarged and Revised. 4to., £1. 10*s.*

ROBERT LISTON, F.R.S.

PRACTICAL SURGERY. Fourth Edition. 8vo., 22*s.*

D. D. LOGAN, M.D., M.R.C.P.LOND.

ON OBSTINATE DISEASES OF THE SKIN. Fcap. 8vo., 2*s.* 6*d.*

LONDON HOSPITAL.

CLINICAL LECTURES AND REPORTS BY THE MEDICAL AND SURGICAL STAFF. With Illustrations. Vols. I. to IV. 8vo., 7*s.* 6*d.*

LONDON MEDICAL SOCIETY OF OBSERVATION.

WHAT TO OBSERVE AT THE BED-SIDE, AND AFTER DEATH. Published by Authority. Second Edition. Foolscap 8vo., 4*s.* 6*d.*

HENRY LOWNDES, M.R.C.S.

AN ESSAY ON THE MAINTENANCE OF HEALTH. Fcap. 8vo., 2*s.* 6*d.*

WILLIAM MACCORMAC, F.R.C.S., M.R.I.A.

NOTES AND RECOLLECTIONS OF AN AMBULANCE SURGEON; being an Account of Work done under the Red Cross during the Campaign of 1870. With 8 Plates. 8vo., 7*s.* 6*d.*

MORELL MACKENZIE, M.D. LOND., M.R.C.P.

I.

GROWTHS IN THE LARYNX, with Reports and an Analysis of 100 consecutive Cases treated by the Author since the Invention of the Laryngoscope. With Coloured Plates. 8vo., 12*s.* 6*d.*

II.

HOARSENESS, LOSS OF VOICE, AND STRIDULOUS BREATHING in relation to NERVO-MUSCULAR AFFECTIONS of the LARYNX. Second Edition. Fully Illustrated. 8vo., 3*s.* 6*d.*

A. C. MACLEOD, M.R.C.P.LOND.

ACHOLIC DISEASES; comprising Jaundice, Diarrhœa, Dysentery, and Cholera. Post 8vo., 5*s.* 6*d.*

GEORGE H. B. MACLEOD, M.D., F.R.C.S.EDIN.

NOTES ON THE SURGERY OF THE CRIMEAN WAR; with REMARKS on GUN-SHOT WOUNDS. 8vo., 10*s.* 6*d.*

WM. MACLEOD, M.D., F.R.C.P.EDIN.

THE THEORY OF THE TREATMENT OF DISEASE ADOPTED AT BEN RHYDDING. Fcap. 8vo., 2*s.* 6*d.*

JOSEPH MACLISE, F.R.C.S.

I.

SURGICAL ANATOMY. A Series of Dissections, illustrating the Principal Regions of the Human Body. Second Edition, folio, cloth, £3. 12*s.*; half-morocco, £4. 4*s.*

II.

ON DISLOCATIONS AND FRACTURES. This Work is Uniform with "Surgical Anatomy;" folio, cloth, £2. 10*s.*; half-morocco, £2. 17*s.*

N. C. MACNAMARA.

I.

A MANUAL OF THE DISEASES OF THE EYE. With Coloured Plates. Fcap. 8vo., 12*s.* 6*d.*

II.

A TREATISE ON ASIATIC CHOLERA; with Maps. 8vo., 16*s.*

WM. MARCET, M.D., F.R.C.P., F.R.S.

ON CHRONIC ALCOHOLIC INTOXICATION; with an INQUIRY INTO THE INFLUENCE OF THE ABUSE OF ALCOHOL AS A PREDISPOSING CAUSE OF DISEASE. Second Edition, much enlarged. Foolscap 8vo., 4*s.* 6*d.*

J. MACPHERSON, M.D.

CHOLERA IN ITS HOME; with a Sketch of the Pathology and Treatment of the Disease. Crown 8vo., 5*s.*

W. O. MARKHAM, M.D., F.R.C.P.

I.

DISEASES OF THE HEART: THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT. Second Edition. Post 8vo., 6*s.*

II.

SKODA ON AUSCULTATION AND PERCUSSION. Post 8vo., 6*s.*

ALEXANDER MARSDEN, M.D., F.R.C.S.

A NEW AND SUCCESSFUL MODE OF TREATING CERTAIN FORMS OF CANCER; to which is prefixed a Practical and Systematic Description of all the Varieties of this Disease. With Coloured Plates. 8vo., 6*s.* 6*d.*

SIR RANALD MARTIN, C.B., F.R.C.S., F.R.S.

INFLUENCE OF TROPICAL CLIMATES IN PRODUCING THE ACUTE ENDEMIC DISEASES OF EUROPEANS; including Practical Observations on their Chronic Sequelæ under the Influences of the Climate of Europe. Second Edition, much enlarged. 8vo., 20*s.*

P. MARTYN, M.D.LOND.

HOOPING-COUGH; ITS PATHOLOGY AND TREATMENT. With Engravings. 8vo., 2*s.* 6*d.*

C. F. MAUNDER, F.R.C.S.

OPERATIVE SURGERY. With 158 Engravings. Post 8vo., 6*s.*

R. G. MAYNE, M.D., LL.D.

I.

AN EXPOSITORY LEXICON OF THE TERMS, ANCIENT AND MODERN, IN MEDICAL AND GENERAL SCIENCE. 8vo., £2. 10*s.*

II.

A MEDICAL VOCABULARY; or, an Explanation of all Names, Synonymes, Terms, and Phrases used in Medicine and the relative branches of Medical Science. Third Edition. Fcap. 8vo., 8*s.* 6*d.*

EDWARD MERYON, M.D., F.R.C.P.

PATHOLOGICAL AND PRACTICAL RESEARCHES ON THE VARIOUS FORMS OF PARALYSIS. 8vo., 6*s.*

W. J. MOORE, M.D.

I.

HEALTH IN THE TROPICS; or, Sanitary Art applied to Europeans in India. 8vo., 9*s.*

II.

A MANUAL OF THE DISEASES OF INDIA. Fcap. 8vo., 5*s.*

JAMES MORRIS, M.D.LOND.

I.

GERMINAL MATTER AND THE CONTACT THEORY: An Essay on the Morbid Poisons. Second Edition. Crown 8vo., 4*s.* 6*d.*

II.

IRRITABILITY: Popular and Practical Sketches of Common Morbid States and Conditions bordering on Disease; with Hints for Management, Alleviation, and Cure. Crown 8vo., 4*s.* 6*d.*

G. J. MULDER.

THE CHEMISTRY OF WINE. Edited by H. BENCE JONES, M.D., F.R.S. Fcap. 8vo., 6*s.*

W. MURRAY, M.D., M.R.C.P.

EMOTIONAL DISORDERS OF THE SYMPATHETIC SYSTEM OF NERVES. Crown 8vo., 3*s.* 6*d.*

W. B. MUSHET, M.B., M.R.C.P.

ON APOPLEXY, AND ALLIED AFFECTIONS OF THE BRAIN. 8vo., 7*s.*

ARTHUR B. R. MYERS, M.R.C.S.

ON THE ETIOLOGY AND PREVALENCE OF DISEASES of the HEART among SOLDIERS. With Diagrams. The "Alexander" Prize Essay. 8vo., 4*s.*

GEORGE NAYLER, F.R.C.S.

ON THE DISEASES OF THE SKIN. With Plates. 8vo., 10*s.* 6*d.*

J. BIRKBECK NEVINS, M.D.

THE PRESCRIBER'S ANALYSIS OF THE BRITISH PHARMACOPEIA of 1867. 32mo., 3*s.* 6*d.*

PATRICK NICOL, M.B.

A TRANSLATION OF DR. DILLNBERGER'S HANDY-BOOK of the TREATMENT of WOMEN'S and CHILDREN'S DISEASES according to the VIENNA MEDICAL SCHOOL. With Prescriptions. Fcap. 8vo., 5*s.*

H. M. NOAD, PH.D., F.R.S.

THE INDUCTION COIL, being a Popular Explanation of the Electrical Principles on which it is constructed. Third Edition. With Engravings. Fcap. 8vo., 3*s.*

SELBY NORTON, M.D.

INFANTILE DISEASES: their Causes, Prevention, and Treatment, showing by what Means the present Mortality may be greatly reduced. Fcap. 8vo., 2*s.* 6*d.*

FRANCIS OPPERT, M.D., M.R.C.P.

I.

HOSPITALS, INFIRMARIES, AND DISPENSARIES; their Construction, Interior Arrangement, and Management, with Descriptions of existing Institutions. With 58 Engravings. Royal 8vo., 10*s.* 6*d.*

II.

VISCERAL AND HEREDITARY SYPHILIS. 8vo., 5*s.*

WM. MILLER ORD, M.B. LOND.

NOTES ON COMPARATIVE ANATOMY: A Syllabus of a Course of Lectures delivered at St. Thomas's Hospital. Crown 8vo, 5*s.*

LANGSTON PARKER, F.R.C.S.

THE MODERN TREATMENT OF SYPHILITIC DISEASES, both Primary and Secondary; comprising the Treatment of Constitutional and Confirmed Syphilis, by a safe and successful Method. Fifth Edition, 8vo., 10*s.* 6*d.*

E. A. PARKES, M.D., F.R.C.P., F.R.S.

I.

A MANUAL OF PRACTICAL HYGIENE; intended especially for the Medical Officers of the Army. With Plates and Woodcuts. 3rd Edition, 8vo., 16*s.*

II.

THE URINE: ITS COMPOSITION IN HEALTH AND DISEASE, AND UNDER THE ACTION OF REMEDIES. 8vo., 12*s.*

JOHN PARKIN, M.D., F.R.C.S.

THE ANTIDOTAL TREATMENT AND PREVENTION OF THE EPIDEMIC CHOLERA. Third Edition. 8vo., 7*s.* 6*d.*

JAMES PART, F.R.C.S.

THE MEDICAL AND SURGICAL POCKET CASE BOOK, for the Registration of important Cases in Private Practice, and to assist the Student of Hospital Practice. Second Edition. 2*s.* 6*d.*

JOHN PATTERSON, M.D.

EGYPT AND THE NILE AS A WINTER RESORT FOR PULMONARY AND OTHER INVALIDS. Fcap. 8vo., 3*s.*

F. W. PAVY, M.D., F.R.S., F.R.C.P.

I.

DIABETES: RESEARCHES ON ITS NATURE AND TREATMENT. Second Edition. With Engravings. 8vo., 10*s.*

II.

DIGESTION: ITS DISORDERS AND THEIR TREATMENT. Second Edition. 8vo., 8*s.* 6*d.*

T. B. PEACOCK, M.D., F.R.C.P.

I.

ON MALFORMATIONS OF THE HUMAN HEART. With Original Cases and Illustrations. Second Edition. With 8 Plates. 8vo., 10*s.*

II.

ON SOME OF THE CAUSES AND EFFECTS OF VALVULAR DISEASE OF THE HEART. With Engravings. 8vo., 5*s.*

JONATHAN PEREIRA, M.D., F.R.S.

SELECTA E PRÆSCRIPTIS. Fifteenth Edition. 24mo., 5*s.*

JAMES H. PICKFORD, M.D.

HYGIENE; or, Health as Depending upon the Conditions of the Atmosphere, Food and Drinks, Motion and Rest, Sleep and Wakefulness, Secretions, Excretions, and Retentions, Mental Emotions, Clothing, Bathing, &c. Vol. I. 8vo., 9*s.*

WILLIAM PIRRIE, M.D., C.M., F.R.S.E.

THE PRINCIPLES AND PRACTICE OF SURGERY. With numerous Engravings on Wood. Second Edition. 8vo., 24*s.*

WILLIAM PIRRIE, M.D.

ON HAY ASTHMA, AND THE AFFECTION TERMED HAY FEVER. Fcap. 8vo., 2*s.* 6*d.*

HENRY POWER, F.R.C.S., M.B.LOND.

ILLUSTRATIONS OF SOME OF THE PRINCIPAL DISEASES OF THE EYE: With an Account of their Symptoms, Pathology and Treatment. Twelve Coloured Plates. 8vo., 20*s.*

HENRY F. A. PRATT, M.D., M.R.C.P.

I.

THE GENEALOGY OF CREATION, newly Translated from the Unpointed Hebrew Text of the Book of Genesis, showing the General Scientific Accuracy of the Cosmogony of Moses and the Philosophy of Creation. 8vo., 14*s.*

II.

ON ECCENTRIC AND CENTRIC FORCE: A New Theory of Projection. With Engravings. 8vo., 10*s.*

III.

ON ORBITAL MOTION: The Outlines of a System of Physical Astronomy. With Diagrams. 8vo., 7*s.* 6*d.*

IV.

ASTRONOMICAL INVESTIGATIONS. The Cosmical Relations of the Revolution of the Lunar Apsides. Oceanic Tides. With Engravings. 8vo., 5*s.*

V.

THE ORACLES OF GOD: An Attempt at a Re-interpretation. Part I. The Revealed Cosmos. 8vo., 10*s.*

THE PRESCRIBER'S PHARMACOPŒIA; the Medicines arranged in Classes according to their Action, with their Composition and Doses. By a Practising Physician. Fifth Edition. 32mo., cloth, 2*s.* 6*d.*; roan tuck (for the pocket), 3*s.* 6*d.*

JOHN ROWLISON PRETTY, M.D.

AIDS DURING LABOUR, including the Administration of Chloroform, the Management of Placenta and Post-partum Hæmorrhage. Fcap. 8vo., 4*s.* 6*d.*

P. C. PRICE, F.R.C.S.

AN ESSAY ON EXCISION OF THE KNEE-JOINT. With Coloured Plates. With Memoir of the Author and Notes by Henry Smith, F.R.C.S. Royal 8vo., 14*s.*

LAKE PRICE.

PHOTOGRAPHIC MANIPULATION: A Manual treating of the Practice of the Art, and its various Applications to Nature. With numerous Engravings. Second Edition. Crown 8vo., 6*s*. 6*d*.

W. O. PRIESTLEY, M.D., F.R.C.P.

LECTURES ON THE DEVELOPMENT OF THE GRAVID UTERUS. 8vo., 5*s*. 6*d*.

F. H. RAMSBOTHAM, M.D., F.R.C.P.

THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY. Illustrated with One Hundred and Twenty Plates on Steel and Wood; forming one thick handsome volume. Fifth Edition. 8vo., 22*s*.

THOMAS READE, M.B.T.C.D., L.R.C.S.I.

SYPHILITIC AFFECTIONS OF THE NERVOUS SYSTEM, AND A CASE OF SYMMETRICAL MUSCULAR ATROPHY; with other Contributions to the Pathology of the Spinal Marrow. Post 8vo., 5*s*.

DU BOIS REYMOND.

ANIMAL ELECTRICITY; Edited by H. BENCE JONES, M.D., F.R.S. With Fifty Engravings on Wood. Foolscap 8vo., 6*s*.

J. RUSSELL REYNOLDS, M.D.LOND., F.R.C.P., F.R.S.

I.

EPILEPSY: ITS SYMPTOMS, TREATMENT, AND RELATION TO OTHER CHRONIC CONVULSIVE DISEASES. 8vo., 10*s*.

II.

THE DIAGNOSIS OF DISEASES OF THE BRAIN, SPINAL CORD, AND THEIR APPENDAGES. 8vo., 8*s*.

III.

LECTURES ON THE CLINICAL USES OF ELECTRICITY delivered at University College Hospital. Post 8vo., 3*s*. 6*d*.

B. W. RICHARDSON, M.D., F.R.C.P., F.R.S.

I.

ON THE CAUSE OF THE COAGULATION OF THE BLOOD. Being the ASTLEY COOPER PRIZE ESSAY for 1856. With a Practical Appendix. 8vo., 16*s*.

II.

DISCOURSES ON PRACTICAL PHYSIC 8vo., 5*s*.

WILLIAM ROBERTS, M.D., F.R.C.P.

AN ESSAY ON WASTING PALSY; being a Systematic Treatise on the Disease hitherto described as ATROPHIE MUSCULAIRE PROGRESSIVE. With Four Plates. 8vo., 5*s.*

C. H. F. ROUTH, D.M., M.R.C.P.

INFANT FEEDING, AND ITS INFLUENCE ON LIFE; Or, the Causes and Prevention of Infant Mortality. Second Edition. Fcap. 8vo., 6*s.*

W. H. ROBERTSON, M.D., M.R.C.P.

I.

THE NATURE AND TREATMENT OF GOUT. 8vo., 10*s.* 6*d.*

II.

A TREATISE ON DIET AND REGIMEN. Fourth Edition. 2 vols. Post 8vo., 12*s.*

JAMES ROGERS, M.D.

ON THE PRESENT STATE OF THERAPEUTICS. With some Suggestions for placing it on a more scientific basis. 8vo., 6*s.* 6*d.*

G. R. ROWE, M.D.

NERVOUS DISEASES, LIVER AND STOMACH COMPLAINTS, LOW SPIRITS, INDIGESTION, GOUT, ASTHMA, AND DISORDERS PRODUCED BY TROPICAL CLIMATES. With Cases. Sixteenth Edition. Fcap. 8vo., 2*s.* 6*d.*

J. F. ROYLE, M.D., F.R.S., AND F. W. HEADLAND, M.D., F.R.C.P.

A MANUAL OF MATERIA MEDICA AND THERAPEUTICS. With numerous Engravings on Wood. Fifth Edition. Fcap. 8vo., 12*s.* 6*d.*

ST. GEORGE'S HOSPITAL REPORTS. Vols. I to V. 8vo., 7*s.* 6*d.*

ST. THOMAS'S HOSPITAL REPORTS. Vols. I. and II., New Series, 8vo., 8*s.*

H. HYDE SALTER, M.D., F.R.C.P., F.R.S.

ASTHMA. Second Edition. 8vo., 10*s.*

W. H. O. SANKEY, M.D.LOND., F.R.C.P.

LECTURES ON MENTAL DISEASES. 8vo., 8*s.*

A. E. SANSOM, M.D.LOND., M.R.C.P.

CHLOROFORM: ITS ACTION AND ADMINISTRATION. A Handbook. With Engravings. Crown 8vo., 5*s.*

HENRY SAVAGE, M.D.LOND., F.R.C.S.

THE SURGERY, SURGICAL PATHOLOGY, AND SURGICAL ANATOMY of the FEMALE PELVIC ORGANS, in a Series of Coloured Plates taken from Nature. With Commentaries, Notes and Cases. Second Edition, greatly enlarged. 4to., £1. 11*s.* 6*d.*

JOHN SAVORY, M.S.A.

A COMPENDIUM OF DOMESTIC MEDICINE, AND COMPANION TO THE MEDICINE CHEST; intended as a Source of Easy Reference for Clergymen, and for Families residing at a Distance from Professional Assistance. Eighth Edition. 12mo., 5*s.*

HERMANN SCHACHT.

THE MICROSCOPE, AND ITS APPLICATION TO VEGETABLE ANATOMY AND PHYSIOLOGY. Edited by FREDERICK CURREY, M.A. Post 8vo., 6*s.*

R. E. SCORESBY-JACKSON, M.D., F.R.S.E.

MEDICAL CLIMATOLOGY; or, a Topographical and Meteorological Description of the Localities resorted to in Winter and Summer by Invalids of various classes both at Home and Abroad. With an Isothermal Chart. Post 8vo., 12*s.*

R. H. SEMPLE M.D., M.R.C.P.

ON COUGH: its Causes, Varieties, and Treatment. With some practical Remarks on the Use of the Stethoscope as an aid to Diagnosis. Post 8vo., 4*s.* 6*d.*

THOS. SHAPTER, M.D., F.R.C.P.

THE CLIMATE OF THE SOUTH OF DEVON, AND ITS INFLUENCE UPON HEALTH. Second Edition, with Maps. 8vo., 10*s.* 6*d.*

E. SHAW, M.R.C.S.

THE MEDICAL REMEMBRANCER; OR, BOOK OF EMERGENCIES. Fifth Edition. Edited, with Additions, by JONATHAN HUTCHINSON, F.R.C.S. 32mo., 2*s.* 6*d.*

JOHN SHEA, M.D., B.A.

A MANUAL OF ANIMAL PHYSIOLOGY. With an Appendix of Questions for the B.A. London and other Examinations. With Engravings. Foolscap 8vo., 5*s.* 6*d.*

FRANCIS SIBSON, M.D., F.R.C.P., F.R.S.

MEDICAL ANATOMY. With 21 coloured Plates. Imperial folio. Cloth, £2. 2*s.*; half-morocco, £2. 10*s.*

E. H. SIEVEKING, M.D., F.R.C.P.

ON EPILEPSY AND EPILEPTIFORM SEIZURES: their Causes, Pathology, and Treatment. Second Edition. Post 8vo., 10*s.* 6*d.*

E. B. SINCLAIR, M.D., F.K.Q.C.P., AND G. JOHNSTON, M.D., F.K.Q.C.P.

PRACTICAL MIDWIFERY: Comprising an Account of 13,748 Deliveries, which occurred in the Dublin Lying-in Hospital, during a period of Seven Years. 8vo., 10*s.*

J. L. SIORDET, M.B.LOND., M.R.C.P.

MENTONE IN ITS MEDICAL ASPECT. Foolscap 8vo., 2*s.* 6*d.*

ALFRED SMEE, M.R.C.S., F.R.S.

GENERAL DEBILITY AND DEFECTIVE NUTRITION; their Causes, Consequences, and Treatment. Second Edition. Fcap. 8vo., 3*s.* 6*d.*

WM. SMELLIE, M.D.

OBSTETRIC PLATES: being a Selection from the more Important and Practical Illustrations contained in the Original Work. With Anatomical and Practical Directions. 8vo., 5*s.*

HENRY SMITH, F.R.C.S.

I.

ON STRICTURE OF THE URETHRA. 8vo., 7*s.* 6*d.*

II.

HÆMORRHOIDS AND PROLAPSUS OF THE RECTUM: Their Pathology and Treatment, with especial reference to the use of Nitric Acid. Third Edition. Fcap. 8vo., 3*s.*

III.

THE SURGERY OF THE RECTUM. Lettsomian Lectures. Third Edition. Fcap. 8vo., 3*s.* 6*d.*

JOHN SMITH, M.D., F.R.C.S.EDIN.

HANDBOOK OF DENTAL ANATOMY AND SURGERY, FOR THE USE OF STUDENTS AND PRACTITIONERS. Second Edition. Fcap. 8vo., 4*s.* 6*d.*

J. BARKER SMITH.

PHARMACEUTICAL GUIDE TO THE FIRST AND SECOND EXAMINATIONS. Crown 8vo., 6*s.* 6*d.*

W. TYLER SMITH, M.D., F.R.C.P.

A MANUAL OF OBSTETRICS, THEORETICAL AND PRACTICAL. Illustrated with 186 Engravings. Fcap. 8vo., 12*s.* 6*d.*

JOHN SNOW, M.D.

ON CHLOROFORM AND OTHER ANÆSTHETICS: THEIR ACTION AND ADMINISTRATION. Edited, with a Memoir of the Author, by Benjamin W. Richardson, M.D. 8vo., 10*s.* 6*d.*

STANHOPE TEMPLEMAN SPEER, M.D.

PATHOLOGICAL CHEMISTRY, IN ITS APPLICATION TO THE PRACTICE OF MEDICINE. Translated from the French of MM. Becquerel and Rodier. 8vo., reduced to 8*s.*

J. K. SPENDER, M.D.LOND.

A MANUAL OF THE PATHOLOGY AND TREATMENT OF ULCERS AND CUTANEOUS DISEASES OF THE LOWER LIMBS. 8vo., 4*s.*

PETER SQUIRE.

I.

A COMPANION TO THE BRITISH PHARMACOPÆIA. Eighth Edition. 8vo., 10*s.* 6*d.*

II.

THE PHARMACOPÆIAS OF THE LONDON HOSPITALS, arranged in Groups for easy Reference and Comparison. Second Edition. 18mo., 5*s.*

WM. SQUIRE, M.R.C.P.LOND.

TEMPERATURE OBSERVATIONS; containing (1) Temperature Variations in the Diseases of Children, (2) Puerperal Temperatures, (3) Infantile Temperatures in Health and Disease. 8vo., 5*s.*

JOHN STEGGALL, M.D.

I.

A MEDICAL MANUAL FOR APOTHECARIES' HALL AND OTHER MEDICAL BOARDS. Twelfth Edition. 12mo., 10*s.*

II.

A MANUAL FOR THE COLLEGE OF SURGEONS; intended for the Use of Candidates for Examination and Practitioners. Second Edition. 12mo., 10*s.*

III.

FIRST LINES FOR CHEMISTS AND DRUGGISTS PREPARING FOR EXAMINATION AT THE PHARMACEUTICAL SOCIETY. Third Edition. 18mo., 3*s.* 6*d.*

WM. STOWE, M.R.C.S.

A TOXICOLOGICAL CHART, exhibiting at one view the Symptoms, Treatment, and Mode of Detecting the various Poisons, Mineral, Vegetable, and Animal. To which are added concise Directions for the Treatment of Suspended Animation. Twelfth Edition, revised. On Sheet, 2*s.*; mounted on Roller, 5*s.*

FRANCIS SUTTON, F.C.S.

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS; or, the Quantitative Estimation of Chemical Substances by Measure. With Engravings. Second Edition, much enlarged. 8vo., 12*s.*

W. P. SWAIN, F.R.C.S.

INJURIES AND DISEASES OF THE KNEE-JOINT, and their Treatment by Amputation and Excision Contrasted. Jacksonian Prize Essay. With 36 Engravings. 8vo., 9*s.*

J. G. SWAYNE, M.D.

OBSTETRIC APHORISMS FOR THE USE OF STUDENTS COMMENCING MIDWIFERY PRACTICE. With Engravings on Wood. Fifth Edition. Fcap. 8vo., 3*s.* 6*d.*

JOHN TANNER, M.D., M.R.C.P.EDIN.

PRACTICAL MIDWIFERY AND OBSTETRICS, including Anæsthetics. With Numerous Engravings. 8vo., 6*s*. 6*d*.

SIR ALEXANDER TAYLOR, M.D., F.R.S.E.

THE CLIMATE OF PAU; with a Description of the Watering Places of the Pyrenees, and of the Virtues of their respective Mineral Sources in Disease. Third Edition. Post 8vo., 7*s*.

ALFRED S. TAYLOR, M.D., F.R.C.P., F.R.S.

I.

THE PRINCIPLES AND PRACTICE OF MEDICAL JURISPRUDENCE. With 176 Wood Engravings. 8vo., 28*s*.

II.

A MANUAL OF MEDICAL JURISPRUDENCE. Eighth Edition. With Engravings. Fcap. 8vo., 12*s*. 6*d*.

III.

ON POISONS, in relation to MEDICAL JURISPRUDENCE AND MEDICINE. Second Edition. Fcap. 8vo., 12*s*. 6*d*.

THEOPHILUS THOMPSON, M.D., F.R.C.P., F.R.S.

CLINICAL LECTURES ON PULMONARY CONSUMPTION; with additional Chapters by E. SYMES THOMPSON, M.D. With Plates. 8vo., 7*s*. 6*d*.

ROBERT THOMAS, M.D.

THE MODERN PRACTICE OF PHYSIC; exhibiting the Symptoms, Causes, Morbid Appearances, and Treatment of the Diseases of all Climates. Eleventh Edition. Revised by ALGERNON FRAMPTON, M.D. 2 vols. 8vo., 28*s*.

SIR HENRY THOMPSON, F.R.C.S.

I.

STRICTURE OF THE URETHRA AND URINARY FISTULÆ; their Pathology and Treatment. Jacksonian Prize Essay. With Plates. Third Edition. 8vo., 10*s*.

II.

THE DISEASES OF THE PROSTATE; their Pathology and Treatment. With Plates. Third Edition. 8vo., 10*s*.

III.

PRACTICAL LITHOTOMY AND LITHOTRITY; or, An Inquiry into the best Modes of removing Stone from the Bladder. With numerous Engravings. Second Edition. 8vo., 10*s*.

IV.

CLINICAL LECTURES ON DISEASES OF THE URINARY ORGANS. With Engravings. Second Edition. Crown 8vo. 5*s*.

J. C. THOROWGOOD, M.D.LOND.

NOTES ON ASTHMA; its Nature, Forms and Treatment. Crown 8vo., 4*s*.

J. L. W. THUDICHUM, M.D., M.R.C.P.

A TREATISE ON GALL STONES: their Chemistry, Pathology, and Treatment. With Coloured Plates. 8vo., 10*s*.

E. J. TILT, M.D., M.R.C.P.

I.

ON UTERINE AND OVARIAN INFLAMMATION, AND ON THE PHYSIOLOGY AND DISEASES OF MENSTRUATION. Third Edition. 8vo., 12*s.*

II.

A HANDBOOK OF UTERINE THERAPEUTICS AND OF DISEASES OF WOMEN. Third Edition. Post 8vo., 10*s.*

III.

THE CHANGE OF LIFE IN HEALTH AND DISEASE: a Practical Treatise on the Nervous and other Affections incidental to Women at the Decline of Life. Third Edition. Rewritten and Enlarged. 8vo., 10*s.* 6*d.*

ROBERT B. TODD, M.D., F.R.S.

I.

CLINICAL LECTURES ON THE PRACTICE OF MEDICINE. *New Edition, in one Volume, Edited by* DR. BEALE, 8*vo.*, 18*s.*

II.

ON CERTAIN DISEASES OF THE URINARY ORGANS, AND ON DROPSIES. Fcap. 8vo., 6*s.*

JOHN TOMES, F.R.S.

A MANUAL OF DENTAL SURGERY. With 208 Engravings on Wood. Fcap. 8vo., 12*s.* 6*d.*

JAS. M. TURNBULL, M.D., M.R.C.P.

I.

AN INQUIRY INTO THE CURABILITY OF CONSUMPTION, ITS PREVENTION, AND THE PROGRESS OF IMPROVEMENT IN THE TREATMENT. Third Edition. 8vo., 6*s.*

II.

A PRACTICAL TREATISE ON DISORDERS OF THE STOMACH with FERMENTATION; and on the Causes and Treatment of Indigestion. 8vo., 6*s.*

DUNCAN TURNER, L.R.C.P.

A MANUAL OF DIET FOR THE INVALID AND DYSPEPTIC; With Hints on Nursing. Second Edition. Crown 8vo., 2*s.* 6*d.*

R. V. TUSON, F.C.S.

A PHARMACOPŒIA; including the Outlines of Materia Medica and Therapeutics, for the Use of Practitioners and Students of Veterinary Medicine. Post 8vo., 7*s.*

ALEXR. TWEEDIE, M.D., F.R.C.P., F.R.S.

CONTINUED FEVERS: THEIR DISTINCTIVE CHARACTERS, PATHOLOGY, AND TREATMENT. With Coloured Plates. 8vo., 12*s.*

DR. UNDERWOOD.

TREATISE ON THE DISEASES OF CHILDREN. Tenth Edition, with Additions and Corrections by HENRY DAVIES, M.D. 8vo., 15*s.*

VESTIGES OF THE NATURAL HISTORY OF CREATION. Eleventh Edition. Illustrated with 106 Engravings on Wood. 8vo., 7*s.* 6*d.*

WM. G. VALENTIN, F.C.S.

A TEXT-BOOK OF PRACTICAL CHEMISTRY: a Guide to the Course of Practical Instruction given in the Laboratories of the Royal College of Chemistry. With 90 Engravings. 8vo., 10*s.* 6*d.*

J. L. C. SCHROEDER VAN DER KOLK.

THE PATHOLOGY AND THERAPEUTICS OF MENTAL DISEASES. Translated by Mr. RUDALL, F.R.C.S. 8vo., 7*s.* 6*d.*

MISS VEITCH.

HANDBOOK FOR NURSES FOR THE SICK. Crown 8vo., 2*s.* 6*d.*

ROBERT WADE, F.R.C.S.

STRICTURE OF THE URETHRA, ITS COMPLICATIONS AND EFFECTS; a Practical Treatise on the Nature and Treatment of those Affections. Fourth Edition. 8vo., 7*s.* 6*d.*

ADOLPHE WAHLTUCH, M.D.

A DICTIONARY OF MATERIA MEDICA AND THERAPEUTICS. 8vo., 15*s.*

J. WEST WALKER, M.B.LOND.

ON DIPHTHERIA AND DIPHTHERITIC DISEASES. Fcap. 8vo., 3*s.*

CHAS. WALLER, M.D.

ELEMENTS OF PRACTICAL MIDWIFERY; or, Companion to the Lying-in Room. Fourth Edition, with Plates. Fcap. 8vo., 4*s.* 6*d.*

HAYNES WALTON, F.R.C.S.

SURGICAL DISEASES OF THE EYE. With Engravings on Wood. Second Edition. 8vo., 14*s.*

E. J. WARING, M.D., F.R.C.P.LOND.

I.

A MANUAL OF PRACTICAL THERAPEUTICS. Third Edition, Revised. Fcap. 8vo., 12*s.* 6*d.*

II.

THE TROPICAL RESIDENT AT HOME. Letters addressed to Europeans returning from India and the Colonies on Subjects connected with their Health and General Welfare. Crown 8vo., 5*s.*

A. T. H. WATERS, M.D., F.R.C.P.

I.

DISEASES OF THE CHEST. CONTRIBUTIONS TO THEIR CLINICAL HISTORY, PATHOLOGY, AND TREATMENT. With Plates. 8vo., 12*s.* 6*d.*

II.

THE ANATOMY OF THE HUMAN LUNG. The Prize Essay to which the Fothergillian Gold Medal was awarded by the Medical Society of London. Post 8vo., 6*s.* 6*d.*

III.

RESEARCHES ON THE NATURE, PATHOLOGY, AND TREATMENT OF EMPHYSEMA OF THE LUNGS, AND ITS RELATIONS WITH OTHER DISEASES OF THE CHEST. With Engravings. 8vo., 5*s.*

ALLAN WEBB, M.D., F.R.C.S.L.

THE SURGEON'S READY RULES FOR OPERATIONS IN SURGERY. Royal 8vo., 10*s*. 6*d*.

J. SOELBERG WELLS.

I.

A TREATISE ON THE DISEASES OF THE EYE. With Coloured Plates and Wood Engravings. Second Edition. 8vo., 24*s*.

II.

ON LONG, SHORT, AND WEAK SIGHT, and their Treatment by the Scientific Use of Spectacles. Third Edition. With Plates. 8vo., 6*s*.

T. SPENCER WELLS, F.R.C.S.

SCALE OF MEDICINES FOR MERCHANT VESSELS. With Observations on the Means of Preserving the Health of Seamen, &c., &c. Seventh Thousand. Fcap. 8vo., 3*s*. 6*d*.

WEST RIDING LUNATIC ASYLUM REPORTS. Edited by J. Crichton Browne, M.D., F.R.S.E. Vol. I. 8vo, 7*s*. 6*d*.

CHARLES WEST, M.D., F.R.C.P.

LECTURES ON THE DISEASES OF WOMEN. Third Edition. 8vo., 16*s*.

JAMES WHITEHEAD, M.D., M.R.C.P.

ON THE TRANSMISSION FROM PARENT TO OFFSPRING OF SOME FORMS OF DISEASE, AND OF MORBID TAINTS AND TENDENCIES. Second Edition. 8vo., 10*s*. 6*d*.

FORBES WINSLOW, M.D., D.C.L. OXON.

OBSCURE DISEASES OF THE BRAIN AND MIND. Fourth Edition. Carefully Revised. Post 8vo., 10*s*. 6*d*.

T. A. WISE, M.D., F.R.C.P.EDIN.

REVIEW OF THE HISTORY OF MEDICINE AMONG ASIATIC NATIONS. Two Vols. 8vo., 16*s*.

G. C. WITTSTEIN.

PRACTICAL PHARMACEUTICAL CHEMISTRY: An Explanation of Chemical and Pharmaceutical Processes, with the Methods of Testing the Purity of the Preparations, deduced from Original Experiments. Translated from the Second German Edition, by Stephen Darby. 18mo., 6*s*.

ERASMUS WILSON, F.R.C.S., F.R.S.

I.

THE ANATOMIST'S VADE-MECUM: A SYSTEM OF HUMAN ANATOMY. With numerous Illustrations on Wood. Eighth Edition. Fcap. 8vo., 12*s.* 6*d.*

II.

ON DISEASES OF THE SKIN: A SYSTEM OF CUTANEOUS MEDICINE. Sixth Edition. 8vo., 18*s.*

THE SAME WORK; illustrated with finely executed Engravings on Steel, accurately coloured. 8vo., 36*s.*

III.

HEALTHY SKIN: A Treatise on the Management of the Skin and Hair in relation to Health. Seventh Edition. Foolscap 8vo. 2*s.* 6*d.*

IV.

PORTRAITS OF DISEASES OF THE SKIN. Folio. Fasciculi I. to XII., completing the Work. 20*s.* each. The Entire Work, half morocco, £13.

V.

THE STUDENT'S BOOK OF CUTANEOUS MEDICINE AND DISEASES OF THE SKIN. Post 8vo., 8*s.* 6*d.*

VI.

LECTURES ON EKZEMA AND EKZEMATOUS AFFECTIONS; with an Introduction on the General Pathology of the Skin, and an Appendix of Essays and Cases. 8vo. 10*s.* 6*d.*

VII.

LECTURES ON DERMATOLOGY DELIVERED AT THE ROYAL COLLEGE OF SURGEONS, JANUARY, 1870: Synopsis of Diseases of the Skin. 8vo., 6*s.*

VIII.

ON SYPHILIS, CONSTITUTIONAL AND HEREDITARY; AND ON SYPHILITIC ERUPTIONS. With Four Coloured Plates. 8vo., 16*s.*

IX.

A THREE WEEKS' SCAMPER THROUGH THE SPAS OF GERMANY AND BELGIUM, with an Appendix on the Nature and Uses of Mineral Waters. Post 8vo., 6*s.* 6*d.*

X.

THE EASTERN OR TURKISH BATH: its History, Revival in Britain, and Application to the Purposes of Health. Foolscap 8vo., 2*s.*

* * *

A. WOLFF, F.R.C.S.

ZYMOTIC DISEASES: their Correlation and Causation. Post 8vo., 5*s.*

* * *

HENRY G. WRIGHT, M.D., M.R.C.P.

I.

UTERINE DISORDERS: their Constitutional Influence and Treatment. 8vo., 7*s.* 6*d.*

II.

HEADACHES; their Causes and their Cure. Fourth Edition. Fcap. 8vo., 2*s.* 6*d.*

CHURCHILL'S SERIES OF MANUALS.

Fcap. 8vo., 12*s.* 6*d.* each.

"We here give Mr. Churchill public thanks for the positive benefit conferred on the Medical Profession, by the series of beautiful and cheap Manuals which bear his imprint."—*British and Foreign Medical Review.*

AGGREGATE SALE, 160,000 COPIES.

ANATOMY. With 280 Engravings. Eighth Edition. By Erasmus Wilson, F.R.C.S., F.R.S.

BOTANY. With 1,127 Engravings. Second Edition. By Robert Bentley, F.L.S.

CHEMISTRY. With 193 Engravings. Tenth Edition, 14*s.* By George Fownes, F.R.S., H. Bence Jones, M.D., F.R.S., and Henry Watts, B.A., F.R.S.

DENTAL SURGERY. With 208 Engravings. By John Tomes, F.R.S.

EYE, DISEASES OF. With 14 coloured Plates and 52 Wood Engravings. By C. Macnamara.

MATERIA MEDICA. With 113 Engravings. Fifth Edition. By J. Forbes Royle, M.D., F.R.S., and F. W. Headland, M.D., F.R.C.P.

MEDICAL JURISPRUDENCE. With 45 Engravings. Eighth Edition. By Alfred Swaine Taylor, M.D., F.R.S.

PRACTICE OF MEDICINE. Second Edition. By G. Hilaro Barlow, M.D., M.A.

The **MICROSCOPE and its REVELATIONS.** With 25 Plates and 412 Wood Engravings. Fourth Edition. By W. B. Carpenter, M.D., F.R.S.

NATURAL PHILOSOPHY. With 701 Engravings. Sixth Edition. By Charles Brooke, M.B., M.A., F.R.S. *Based on the Work of the late Dr. Golding Bird.*

OBSTETRICS. With numerous Engravings. By W. Tyler Smith, M.D., F.R.C.P. (*Reprinting*).

OPHTHALMIC MEDICINE and SURGERY. With 9 coloured Plates and 173 Wood Engravings. Third Edition. By T. Wharton Jones, F.R.C.S., F.R.S.

PATHOLOGICAL ANATOMY. With 167 Engravings. By C. Handfield Jones, M.B., F.R.S., and E. H. Sieveking, M.D., F.R.C.P.

PHYSIOLOGY. With 2 Steel Plates and 250 Engravings. Fourth Edition. By William B. Carpenter, M.D., F.R.S.

POISONS. Second Edition. By Alfred Swaine Taylor, M.D., F.R.S.

PRACTICAL ANATOMY. With 226 Engravings. Second Edition. By Christopher Heath, F.R.C.S.

SURGERY. With numerous Engravings. By Thomas Bryant, F.R.C.S. (*In the Press*).

THERAPEUTICS. Third Edition. By E. J. Waring, M.D., F.R.C.P.

BLANCHARD & SONS, PRINTERS, 62, MILLBANK STREET;
AND HORSE-AND-GROOM YARD, WOOD STREET, WESTMINSTER.

LANE MEDICAL LIBRARY
STANFORD UNIVERSITY MEDICAL CENTER
STANFORD, CALIFORNIA 94305

Ignorance of Library's rules does not exempt violators from penalties.

25M-9-70-28042